Dutypoint Systems

VG

Variable Speed
Twin Pump Booster Sets
FULL USER GUIDE

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Every effort has been made to ensure the accuracy of this manual at the time of printing, however our policy of continuous improvement means that specifications and instructions may change without notice.

Please Note: If the sytem that you have purchased has been modified, updated or otherwise altered from the Dutypoint standard range, additional information applicable to the change(s) will be provided in Appendix E at the end of this manual.

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Dutypoint Part Number VG - M03 *Iss.4 - Aug 2013*

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SAFETY

Important Health & Safety Information

Please read this section before attempting to use or work on your VGPumpset as it contains important Safety Information and the System Operating Limitations.

User Guide - Document Conventions

Throughout this manual, text may be accompanied by one of the following icons. Where these occur the conventions shown below are applied.

In general these conventions will also apply to OEM Manufacture's manuals that are included within this User Guide, however variations may occur, but these will be redefined at the beginning of their manual.

DANGER — **Denotes attention to the possibility of the risk of personal injury or damage to adjacent property if the information is ignored.**

ELECTRIC SHOCK — **Denotes attention to the possibility of life-threatening electric shock if the information is ignored.**

or

WARNING

WARNING — **Denotes attention to a condition that may result in under-performance or damage to the equipment if the information is ignored.**

NOTE — **Denotes attention to an important factor applicable to the action being performed.**

PLEASE READ THE FOLLOWING INFORMATION WHICH IS PROVIDED FOR YOUR SAFETY

United Kingdom Health & Safety at Work Act 1974

Dutypoint responsibility

Section 6(a) of this Act requires manufacturers to advise their customers on the safety and the handling precautions to be observed when installing, operating, maintaining and servicing their products. The user's attention is therefore drawn to the following:

- The appropriate sections of this manual must be read before working on the equipment.
- Installation, operating and maintenance must only be carried out by suitably trained/qualified personnel.
- Normal safety precautions must be taken and appropriate procedures observed to avoid accidents.

Refer to DUTYPOINT SYSTEMS for any technical advice or product information.

Customer / Contractor responsibility

It is the responsibility of the customer and/or the contractor:

- To ensure that anyone working on the equipment is wearing all necessary protective gear/clothing.
- Is aware of appropriate health & safety warnings
- has read the information in this section of the manual.

Pump Servicing

Before attempting to open any unit or service a pump:

- Familiarise yourself with the relevant contents of this manual.
- Installation, maintenance and repair work must only be carried out by trained, skilled and suitably qualified personnel.
- Disconnect or lock-out the power source to ensure that the pump(s) will remain inoperative.
  Locking out the equipment by switching off the release mechanism or set value WILL NOT prevent accidental starting of the motor.
- Allow the pump(s) to cool if over-heated.
- **CLOSE** the isolating valves on the suction and discharge connections of the affected pump(s).
- **VENT** the pump(s) slowly and cautiously – *Refer to Section 4 of this manual.*
- **DRAIN** the pump(s).

Electrical Safety

High voltages

Especially applicable when Variable Speed Controllers (Inverters) are fitted.

- When the inverter variable speed drive head is connected to the power supply the components of the power unit – as well as certain components of the master control unit – are also connected to the power supply.

TOUCHING THESE COMPONENTS CAN SERIOUSLY ENDANGER LIFE!

- Before removing the frequency inverter cover, the system must be disconnected from the power supply. After switching off the power supply **wait at least 5 minutes** before starting work on or in the inverter drive head – the capacitors in the intermediate circuit must be given time to discharge completely via the discharge resistors.
  Up to 800 volts can be present – if there are faults this can be higher.
- All work carried out when the frequency inverter is open must be performed only by suitably qualified and properly authorised personnel.
  When connecting external control wires care must be taken not to short circuit adjacent components. Bare cable ends which are not in use must be insulated.

THE SYSTEM MUST ONLY BE OPERATED WHEN IT HAS BEEN CORRECTLY EARTHED AND PIPES BONDED TO EARTH IN ACCORDANCE WITH IEE REGULATIONS

Electronic safety devices

- The inverter drive heads used in *Dutypoint Systems* Pumpsets contain electronic safety devices which switch off the control element in the event of a fault developing.
  The motor will have zero current but will remain energised as it stops.
- The motor can also be stopped by ‘mechanical blocking’.
- If it is switched off electronically, the motor is disconnected from the mains voltage supply via the electronics in the frequency converter.
  The motor is not voltage-free in the circuit itself.
- Voltage fluctuations and power failures (temporary outages) can cause the motor to switch itself off.
  Repair of faults can cause the motor to start up again unexpectedly!

High voltage testing may damage electronic components

- High voltage tests of the inverter or the motor may damage the electronic components.
  Bridge before the incoming/outgoing terminals L-L2-L3 and U-V-W.
- To avoid incorrect metering by capacitors incorporated in the electronic circuits, isolate the motor from the inverter drive head.

Operating Limits For Standard *Dutypoint* Pumpsets

Type of pumped liquids.	Water with no gas or aggressive substances.
Maximum pumped liquids temperature.	+35°C for domestic uses. (EN 60335-2-41). 40°C for other purposes.
Minimum pumped liquid temperature.	1°C to avoid icing.
Operating ambient temperature.	+5°C to 40°C for indoor installation. (CEI EN 60439-1).
Relative humidity.	Max 50% at 40°C.
Air impurities.	The air must be clean and free of acid vapours, corrosive gases and excessive amounts of dust.
Storage temperature.	+5°C to 50°C.
Suction Conditions. *Refer to notes on Net Positive Suction Head (NPSH) included in Appendix D*	Minimum positive pressure 0.1 Bar, Maximum positive pressure 0.5 Bar.

1

Introduction

This Section introduces the VG Variable Speed Twin Pump Booster Sets and provides an overview of the Pumps and Controllers.

Welcome

Thank you for purchasing one of the **DUTYPOINT VG Variable Speed Twin Pump Booster Sets**.

Dutypoint Systems is a Division of Elmbridge Pumps Company and manufactures pressure boosting pump systems. Since its beginnings as a supplier of pumpsets to the water industry the name 'Dutypoint' has become synonymous with unrivalled quality, service and reliability.

This manual is compiled as a composite to include both the *Dutypoint* package information and the specific manufacturer's information necessary for the installation, safe operation and user maintenance of your pumps.

Please read and familiarise yourself with the contents of this manual.

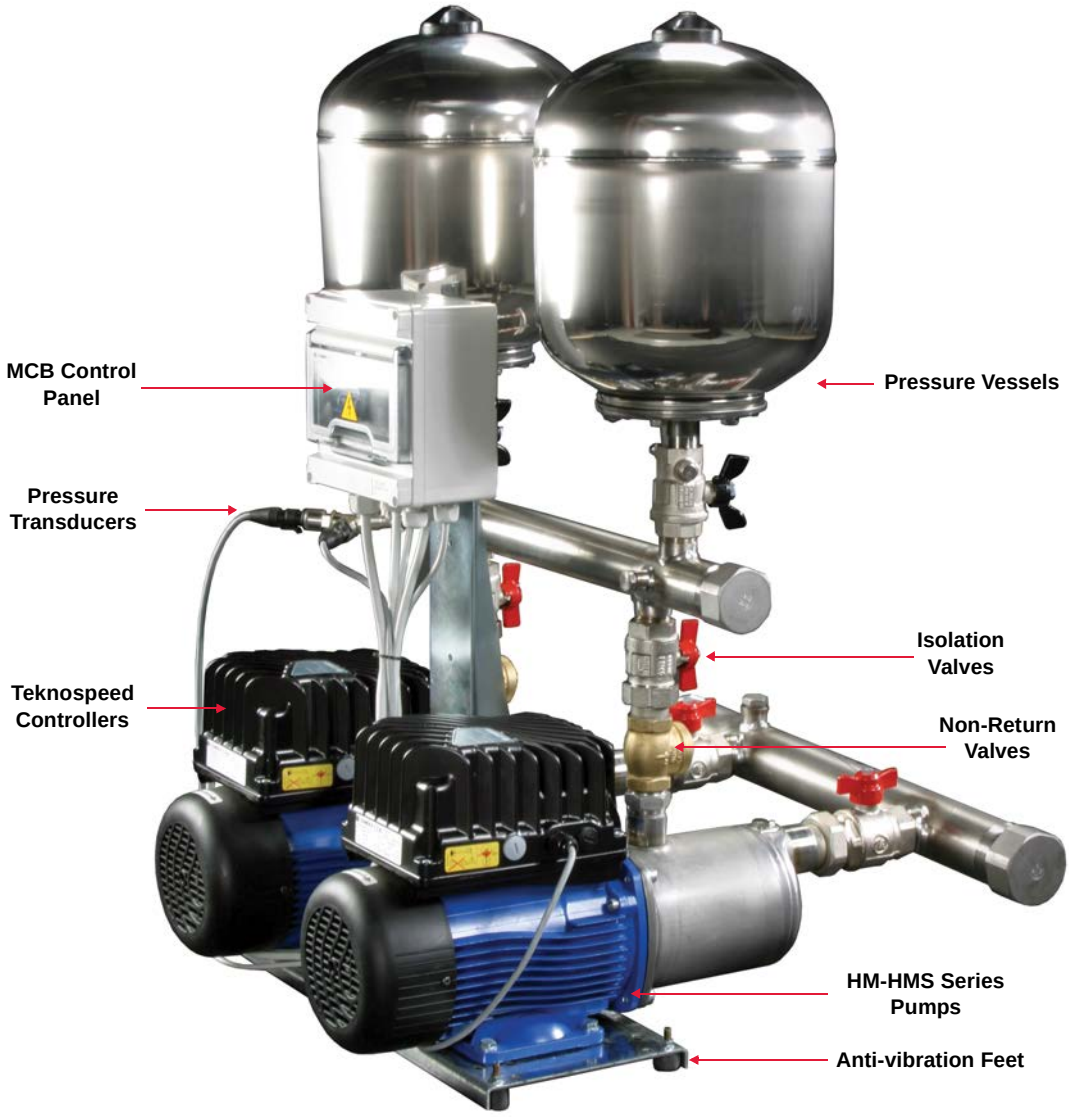


Fig. 1-1 A Typical VG Variable Speed Twin Pump Booster Set

VG Series Overview

The VG Series of variable speed twin pump sets provides a selection of compact, efficient systems based on ITT Lowara manufactured pumps with Teknospeed® speed control.

These quiet pressure pump sets have been designed for use where space is limited, and provides ease of maintenance and reliability. They are ideal for installation in residential property.

Technical features

- Twin variable speed pumps.
- Teknospeed intelligent control.
- Cyclic duty changeover
- Integrated adjustable pressure control.
- System pressure gauge.
- Low water cut-out contacts.
- Motor thermistor protection.
- Pressure setpoint adjustment.
- Local electrical isolation with MCB protection.
- Anti-vibration feet.
- Individual alarm warning LED.
- Power Factor controller circuit to maintain the required pressure in the event of mains voltage fluctuations (sinusoidal).
- Common fault volt-free contacts.

Options

- Flexible expansion joints.
- Low level float switch.

Pump Overview

The VG Series uses ITT Lowara HM Series Horizontal Centrifugal Electrical Pumps.

Full details of the pumps are given in the manufacturer's manual republished in Appendix A of this manual.

Fig. 1-2 ITT Lowara HM-HMS Series Pumps

Teknospeed Variable Speed Drive

The Teknospeed (designed and developed by ITT industries) is a simplified air-cooled control attached to the pump which adjusts motor speed so as to constantly provide users with the same pressure, even when demand for water changes.

The controller relies on a 4-20mA signal to maintain a preset pressure. The required pressure set-point can be adjusted by a potentiometer on the side of the unit.

Contacts for a low water floatswitch and for alarm condition are incorporated and a small panel provides Power, Run and Alarm leds. The rate of flash of the Alarm led identifies up to seven different types of fault condition.

Full details of Teknospeed system is given in the manufacturer's manual republished in Appendix B of this manual.

Fig. 1-3 ITT Teknospeed Controller

Pressure Vessels

Pressure Vessels are fitted to the discharge manifold of the pump sets to maintain the pressure in the system when there is no demand and the pumps are stopped.

Full details of vessels used given in the manufacturer's manual republished in Appendix C of this manual.

Fig. 1-4 The Pressure Vessel

Control Panel Overview

The Power Control Panel for the VG Pumpset is a simple unit supporting Power Connection, a local Electrical Isolator, and MCB protection.

Control adjustment and status monitoring is provided on the Teknospeed control unit.

Full details of the Control Panel is given in Section 3 of this manual.

Fig. 1-5 The Control Panel

Commissioning and Post-Installation Help

Dutypoint Systems is a Division of Elmbridge Pumps, a long-established firm of Pumping Engineers specialising in packaged Booster Pumpsets. Operating from our works and offices in Gloucester with easy access to the national motorway network, *Dutypoint* is strategically placed to provide prompt and efficient Commissioning and Maintenance service all over the UK

Commissioning

Before shipment, all Dutypoint booster sets are pre-commissioned. Whilst important procedures such as venting and rotational direction checks need to be carried out on site, parameters including pressure settings and delay timers are adjusted to suit the site conditions as advised.

In practice, a system can almost invariably be made to perform more efficiently if correctly commissioned on site.

Please note that engineer visits are priced at one visit to commission one pump set. If there are multiple units on a site, special terms can be negotiated.

To arrange a commissioning visit, please call the Technical Service Help line shown below.

Post-Installation Help

For any assistance required, call the Technical Service Help line shown below.

TECHSERVICE HELPLINE 01452 300590

2

Specifications, Configurations & Dimensions

This Section lists specifications and specific details for available variants of VG Pumpsets.

- ***Identifying Your Pump***
- ***General Specifications***
- ***Dimensions***
- ***Electrical Specifications***
- ***Pump Performance***

Identifying Your Pump

Attached to each pump is a label (fig 2-1) that identifies the type and specification.

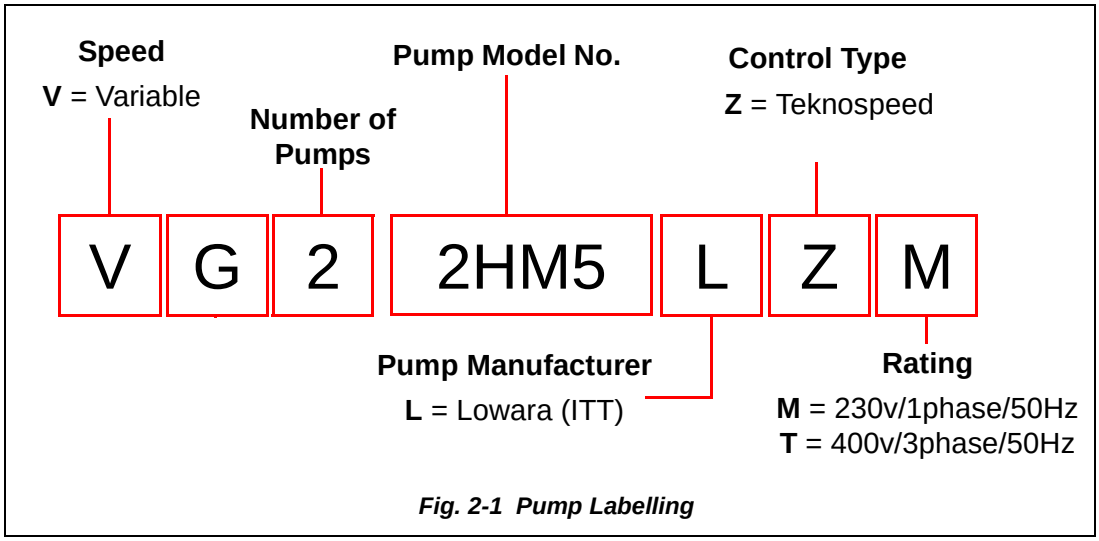


Fig. 2-1 Pump Labelling

General Specifications

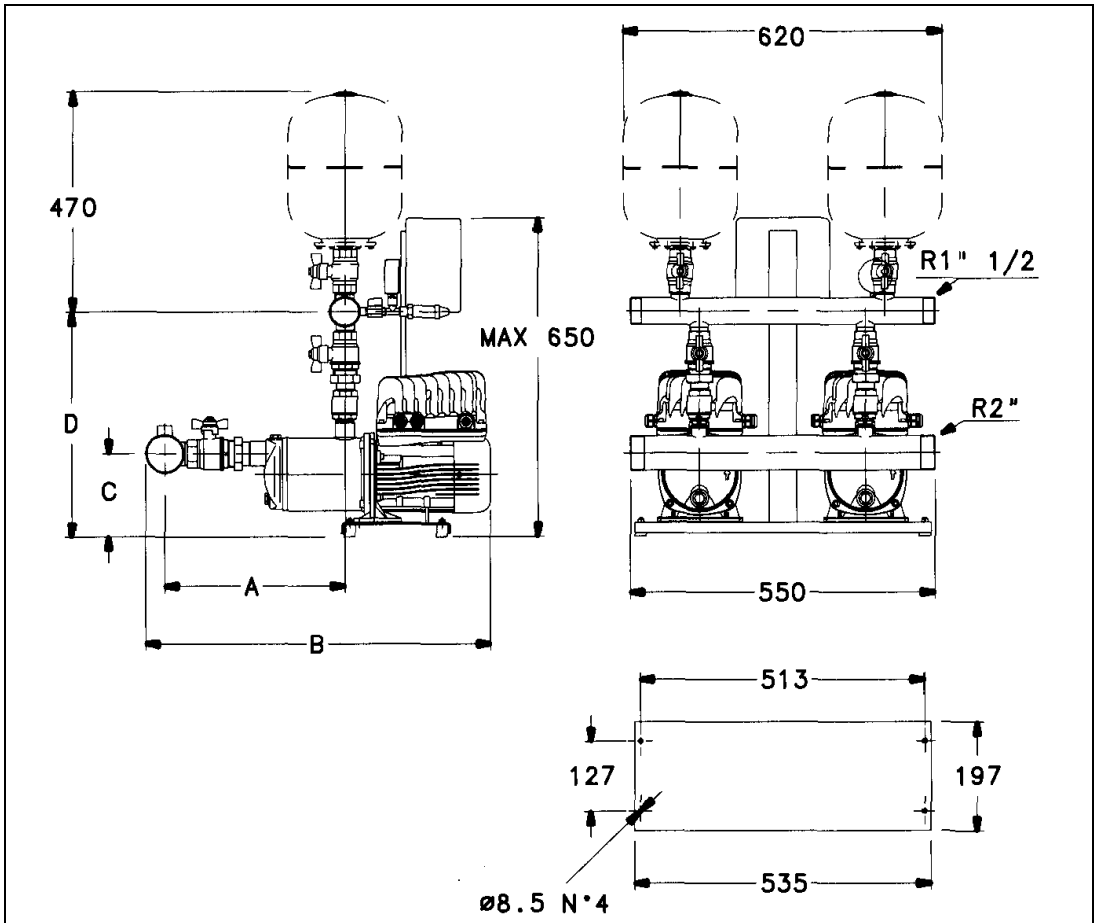
Performance & Control

Flow range	0.1 - 3.6Litres/sec.
Pressure range	2.0 - 5.0
Control type	Teknospeed ®

Construction

Base	Mild steel Galvanised BS729.
Manifolds	AISI 304.
Pressure Vessels	AISI 304/Butyl. PED 97/23/C Certified. WRAS Approved.
Vessel Isolation Valves	PTFE/EN12165 Cu Zn Pb25n.
Pump Isolation Valves	PTFE/EN12165.
Non-Return Valves	EN12165.
Fasteners	BZP BS 3643.
Antivibration Mountings	Integral.
Pumps	***Casings*** AISI 316. ***Impellers*** Thermoplastic.
Max System Pressure	10 Bar.
Max System Temp.	40°C.

Dimensions



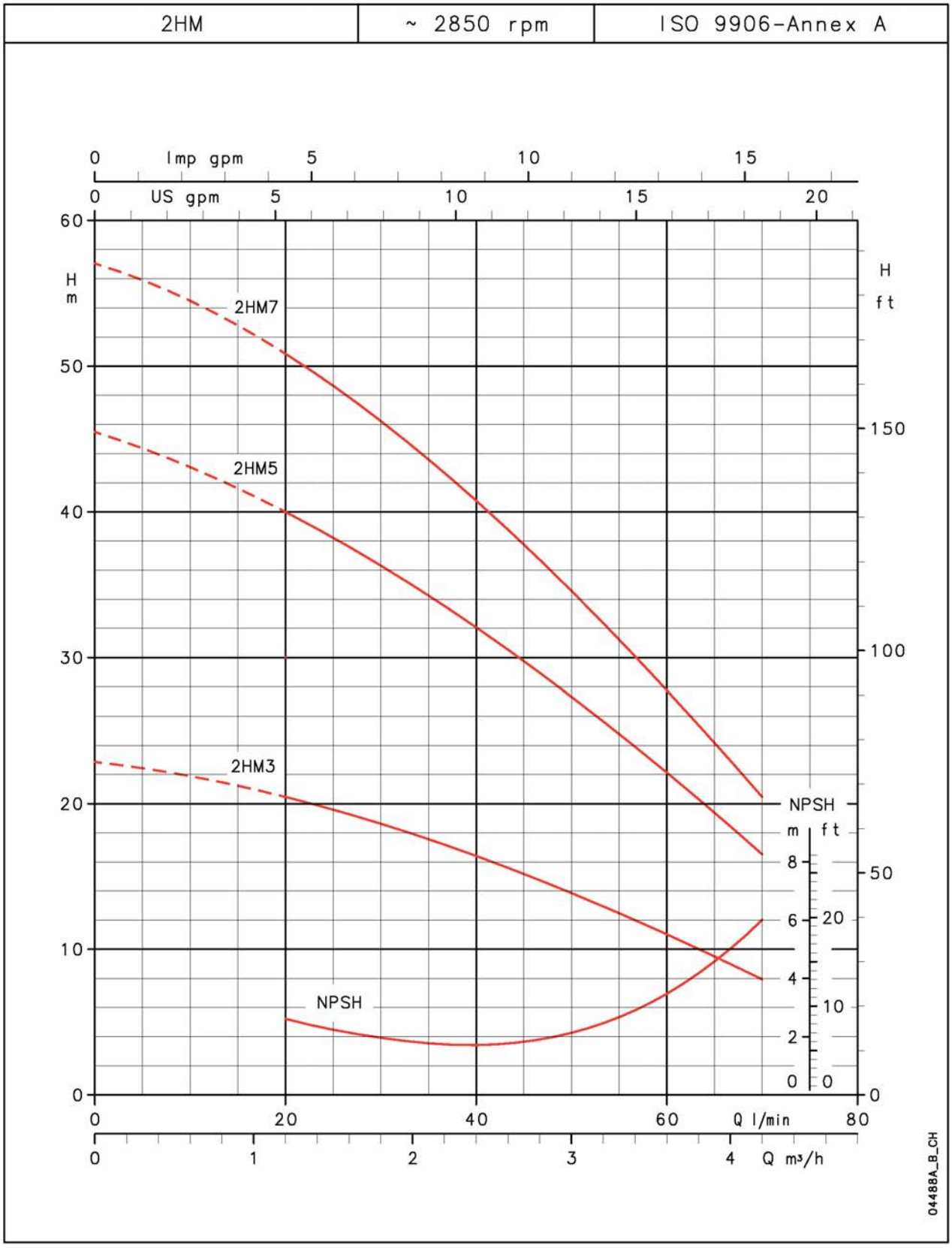
Model	Pump	A(mm)	B(mm)	C(mm)	D(mm)	Weight (kg)
VG2-2HM3-LZM	2HM3ZT	241	520	149	419	62
VG2-2HM5-LZM	2HM5ZT	306	594	149	419	65
VG2-2HM7-LZM	2HM7ZT	331	625	149	419	65
VG2-4HM5-LZM	4HM5ZT	281	569	149	419	70
VG2-4HM9-LZM	4HM9ZT	331	670	141	411	70

Electrical Specifications

Model No.	Controller	Motor Rating	Voltage/ Phase/ Frequency	Full Load Current/ Pump	Full Load Current Total
VG2-2HM3-LZM	Teknospeed	0.30kW	230/1/50	2.30A	4.60A
VG2-2HM5-LZM	Teknospeed	0.55kW	230/1/50	3.50A	7.00A
VG2-2HM7-LZM	Teknospeed	0.75kW	230/1/50	4.90A	9.80A
VG2-4HM5-LZM	Teknospeed	0.55kW	230/1/50	3.50A	7.00A
VG2-4HM9-LZM	Teknospeed	1.10kW	230/1/50	6.80A	13.60A

Pump Performance

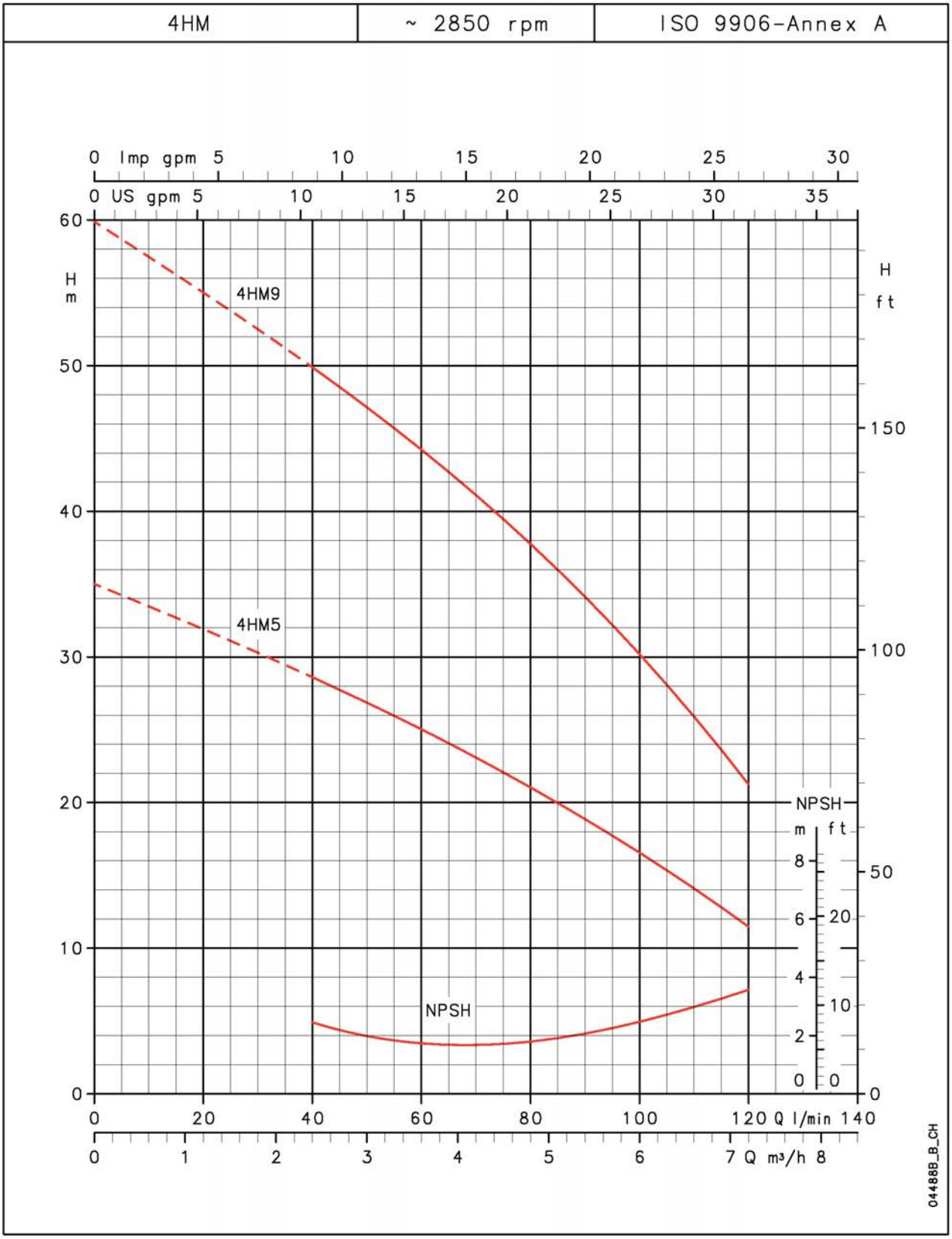
2HM Series Pumps - Operating Characteristics @ 2850rpm 50Hz



The performances are valid for liquids with density ↔= 1.0 kg/dm^3 and kinematic viscosity ↓= 1 mm^2/sec.

Lowara
ITT Industries

4HM Series Pumps - Operating Characteristics @ 2850rpm 50Hz



The performances are valid for liquids with density ↔= 1.0 kg/dm^3 and kinematic viscosity ↓= 1 mm^2/sec.

Lowara
ITT Industries

3

The Control Panel

This Section provides information on the Control Panel fitted to the range of VG Variable Speed Twin Pump Booster Sets.

Control Panel

The User Control Panel on the VG pumpsets is a simple unit, providing a basic power connection point with MCB-protected local isolation, fig 3-1.

Control adjustment for the transducer-based monitoring system and pumpset status monitoring is provided on the fitted Teknospeed Control Unit.

Full details of the Teknospeed® system operation, local connections and status indicators, is given in the manufacturer's manual republished in Appendix B of this manual.

CONTROL BOX QPTKS20/11/U		
CAUTION! Power line protections to be supplied by user PE must be earthed		
RATING DATA		
Power	P = 2 x 1.1kW	
Voltage	U = 230V	
Frequency	f = 50/60Hz	
Current	I_n = 16A	
Short-time withstand current	$I_{cw\ 1s}$ = /	
Peak withstand current	I_{pk} = /	
Short-circuit current	I_k = 4.5kA	
Degree of protection	☐IP54 ☐IP55 ☐IP..	
CABLE		
Power	BK	H07 V-K
Neutral conductor	BU	H07 V-K
Auxiliary	RD	H05 V-K
Protective conductor	GNYE	H07 V-K
	OG	H05 V-K

Tab.A

CONTROL BOX	POWER (kW)	In (A)	Ik (kA eff.)	QF1-2 In (A)	QF1-2 Min S. (mm2)	QF1-2 Max S. (mm2)	PE (mm2)	CONT BOX
QPTKS20/11/U	2x 1.1	16	4.5	10A	1.5	25	4	ABB 12743

Fig. 3-1 The Control Panel

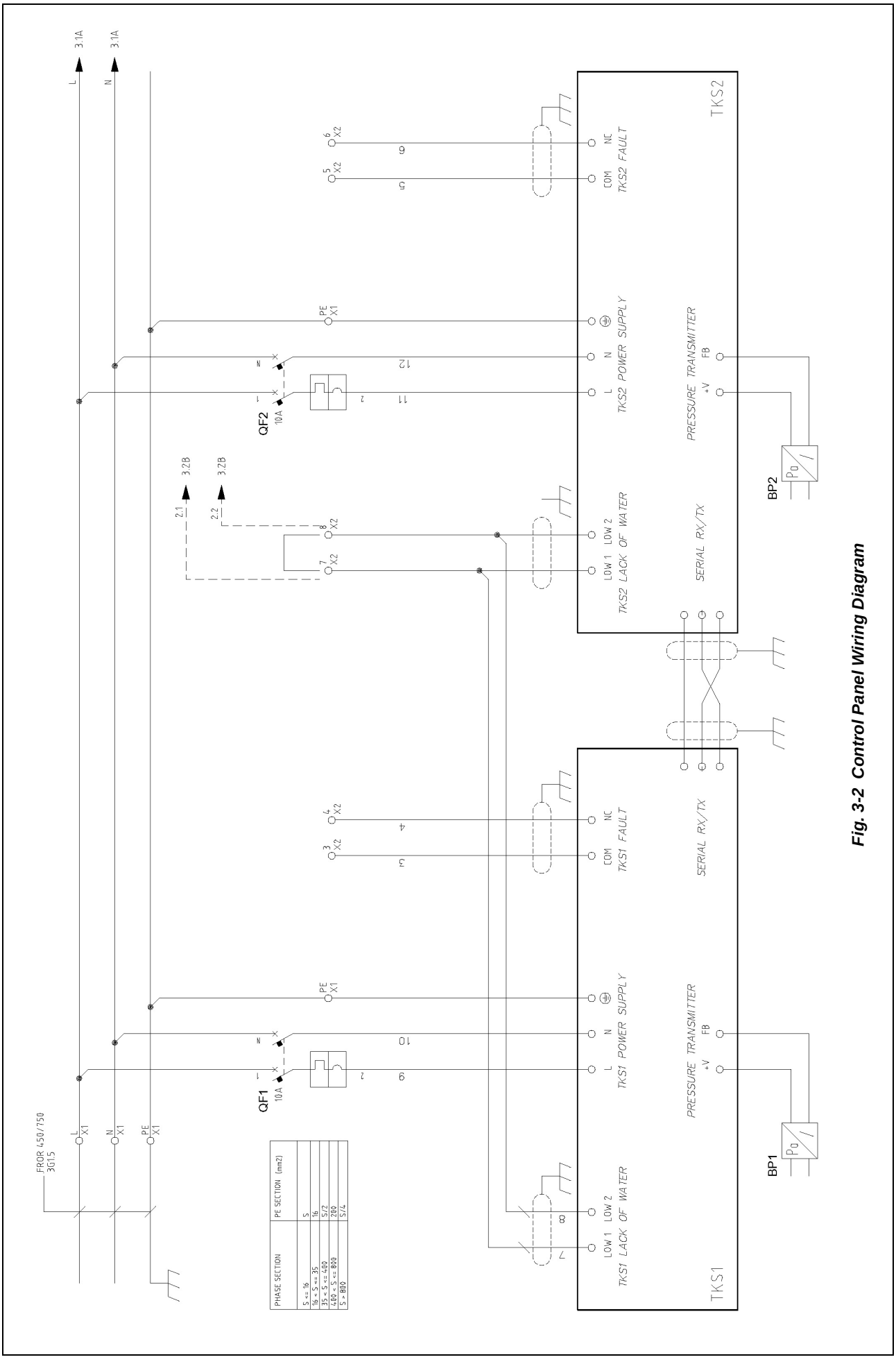


Fig. 3-2 Control Panel Wiring Diagram

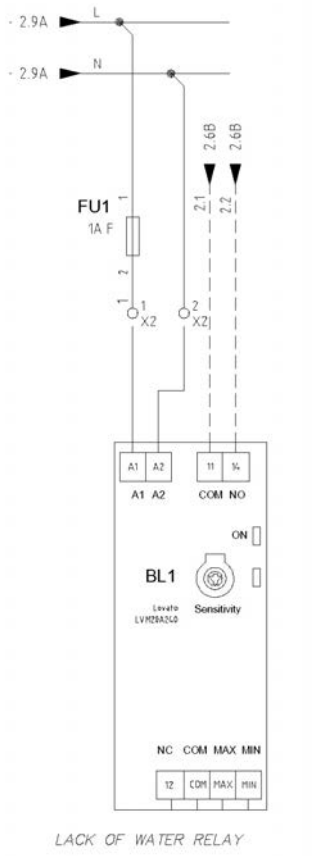
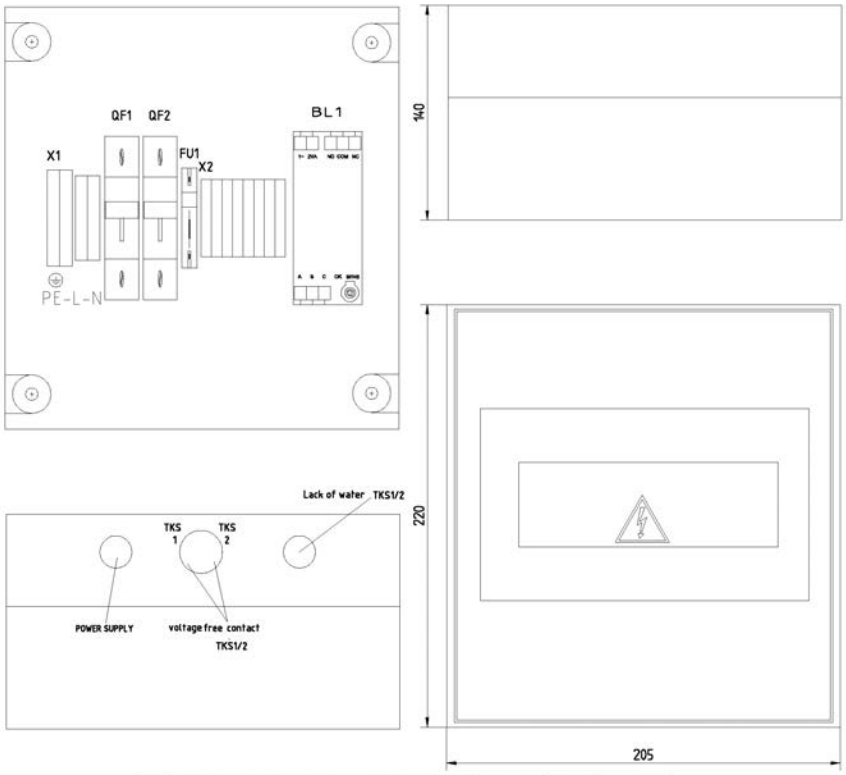


Fig. 3-3 Control Panel Low Water Relay Connection



	Q.TY	DESCRIPTION	MANUFACTURER	TYPE	CODE	RATING
QF1 QF2	2	1P+N AUT. CIRCUIT BREAKER	ABB	SN201L C10		In=10 A Ik=4.5kA Un=230V
FU1	1	FUSE	ITAL WEBER OMEGA	1A F	002656430	5X20 U=250V
FU1	1	FUSE HOLDER	CABUR	SFR4		6.3A 230V
BL1	1	LACK OF WATER RELAY	LOVATO	LVM20 A240	109896360	Un=230Vac
X1 X2	4 7	TERMINAL				4mm² 2.5mm²

Fig. 3-4 Control Panel Connection Layout

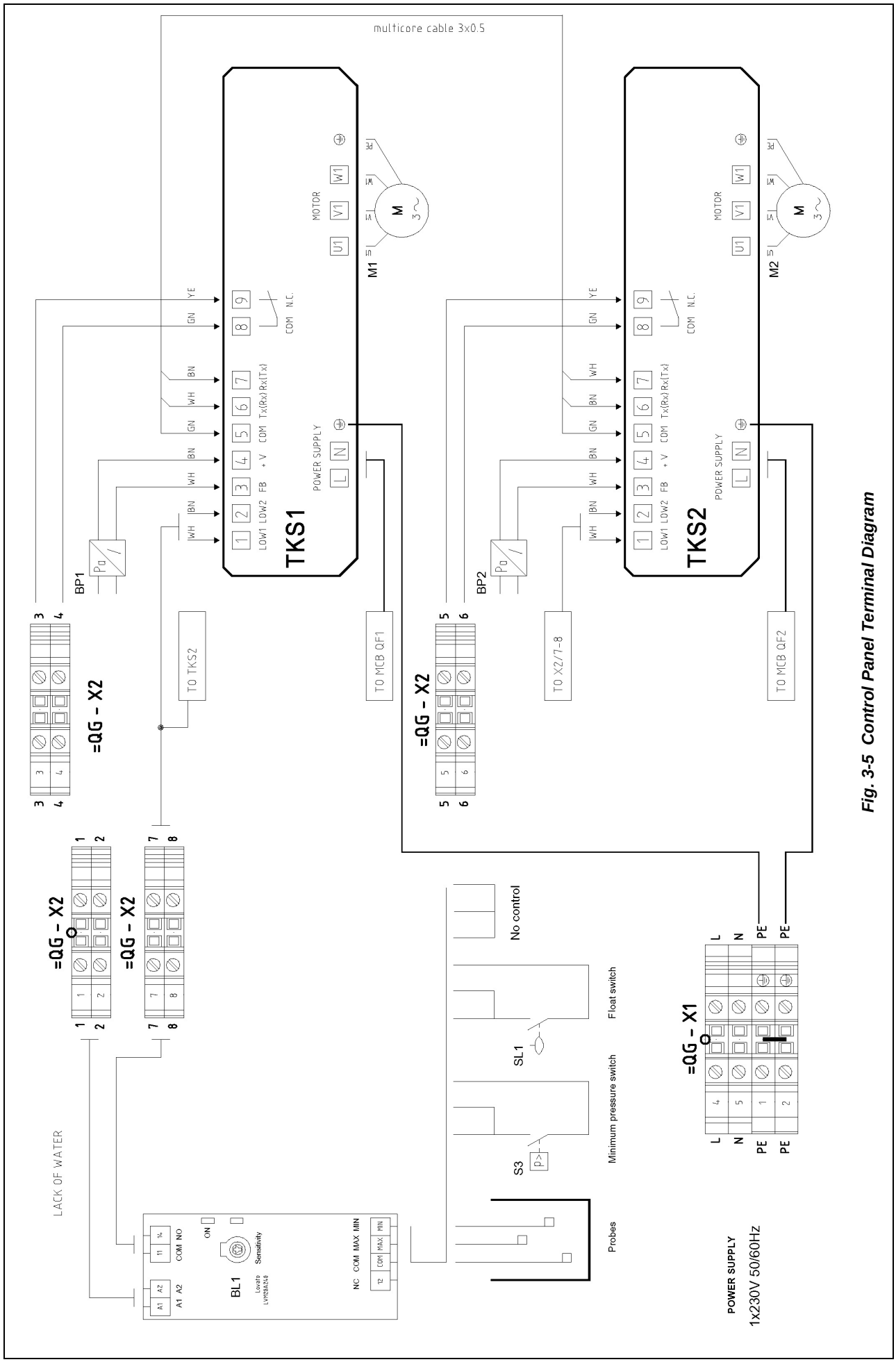


Fig. 3-5 Control Panel Terminal Diagram

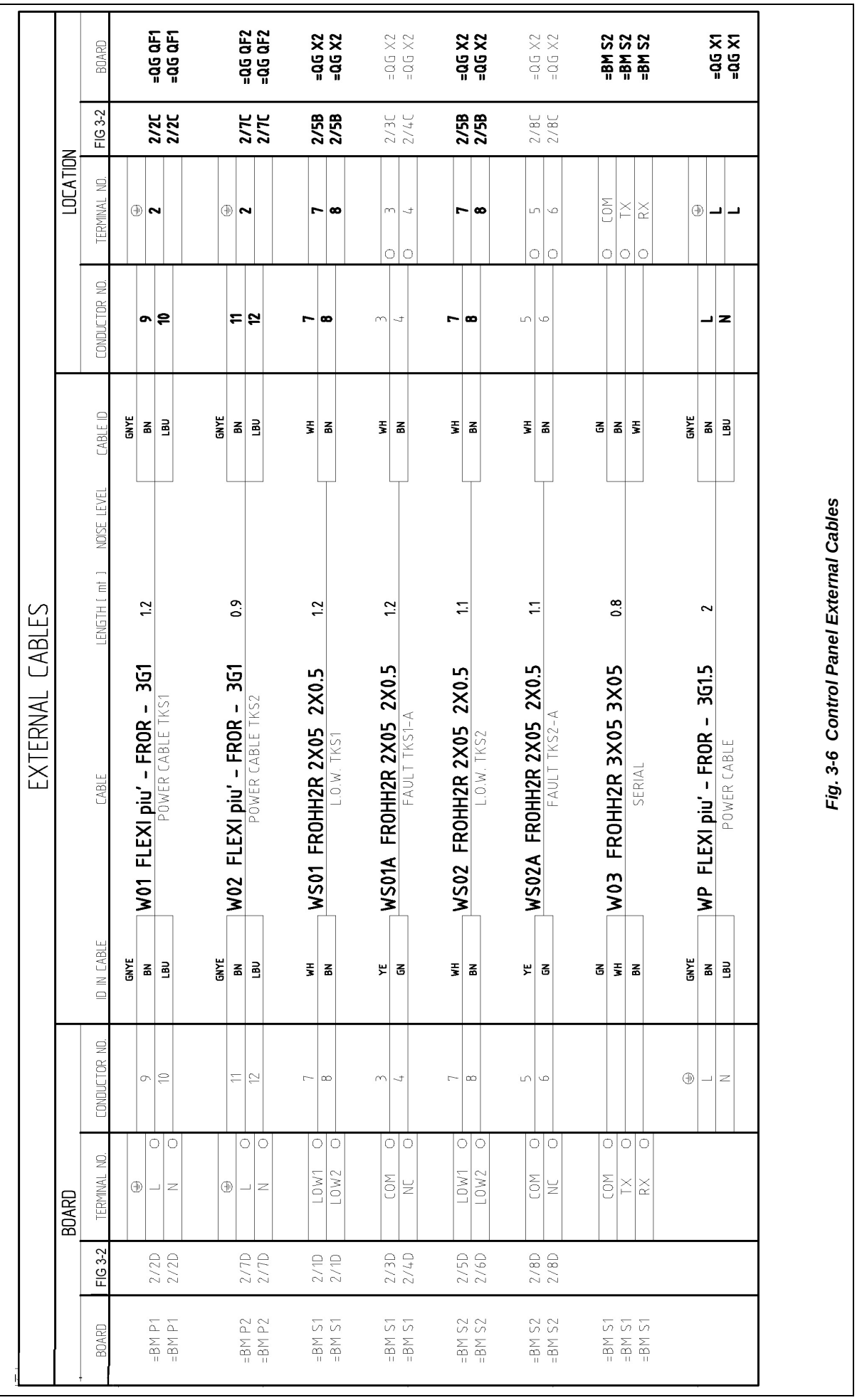


Fig. 3-6 Control Panel External Cables

4

Installation, Commissioning and Routine Maintenance

This Section gives general information on installation, commissioning and routine maintenance procedures for the VG range of Pumpsets.

- ***Installation and Pre-Commissioning Checks***
- ***Pressure Vessel Precharging***
- ***Venting Pumps***
- ***Operational and Performance Tests***
- ***Commissioning/Handover Check***
- ***Routine User Maintenance***

Installationand Commissioning Overview

Before shipment, all *Dutypoint* pumpsets are pre-commissioned. Whilst important procedures such as venting and rotational direction checks need to be carried out on site, initial parameters including pressure settings and delay timers will be adjusted to suit the site conditions previously advised to *Dutypoint*.

In practice, a system can almost invariably be made to perform more efficiently if further re-commissioning is carried out on site.

NOTE **Please note that engineer visits by *Dutypoint* are priced at one visit to commission one pump set. If there are multiple units on a site, special terms can be negotiated. To arrange a commissioning visit, please call the Technical Service Help line 01452 300590.**

Installation and Pre-Commissioning Checks

The following checks should be carried out at the initial installation on site **BEFORE** any run tests are carried out.

DANGER **Ensure that you have read and understood the SAFETY section at the front of this manual before proceeding.**

Pipework and mechanical components

1. Ensure that the mounting area and any associated groundwork provides adequate support for the pumpset.
2. Ensure all supports/brackets are in place and secure.
3. Verify all pipe joints are sealed and tight.

Electrical

ELECTRIC SHOCK **These checks MUST be carried out by a competent electrician.**

1. Check the motor voltage and frequency information on all the motor nameplates and on controllers etc. correspond with that of the source power supply.

WARNING **Ensure that the power source is sufficient to allow the running of two pumps together. (Refer to Section 2 of this manual).**

2. Check that all electrical connections are correctly made and secure. Pay particular attention to Earth and bonding connections.
3. Carry out specific checks for Earth bonding.
4. Carry out NICEIC certification checks as required for the installation, *e.g Earth Loop Impedance, Insulation Tests, etc.*
5. Carry out any other pre-start checks recommended by the pump manufacturer. Refer to the pump manual in Appendix A of this manual. **DO NOT POWER UP AT THIS STAGE.**

Final checks before commissioning

1. Re-check all equipment for any accidental damage caused during installation.
2. Carry out the Precharging and Venting procedures described next.

Pressure Vessel Precharging

Before commissioning starts the precharge of the pressure vessels should be checked.

On variable speed systems the precharge air pressure for vessels should be 90% of the maximum pressure generated by the pump in the pipework system

e.g: If the max. pressure generated by the pump in a system is 6 bar.
This will require a pre-charge pressure of 6 x 90% = 5.4 bar.

Refer to the following table:

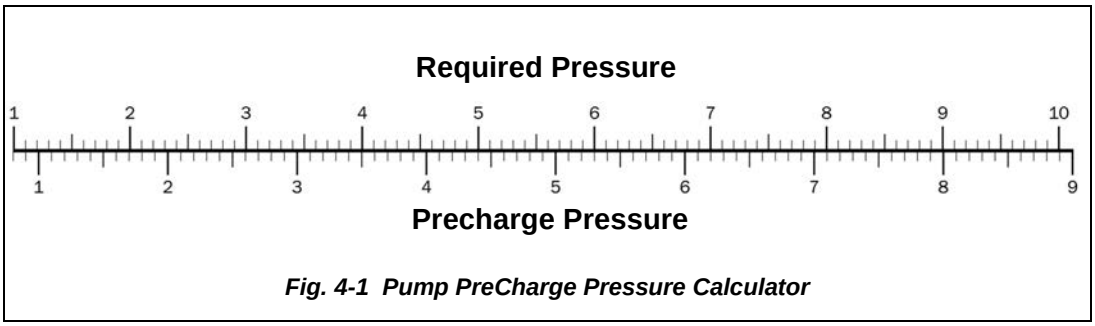


Fig. 4-1 Pump PreCharge Pressure Calculator

To verify the precharge pressure.

1. First check that the expansion or pressure vessel(s) are totally drained of water, and that the system is switched off and no electrical parts are live.
2. Locate the charging valve on each vessel, accessed by removing the plastic cover on the top of the vessel.
3. Connect a portable pressure gauge with a measuring range compatible with the expected pressures in your application, which has a flexible hose and Schrader-type connector to the charging valve.
4. Check the pre-charge pressure above the diaphragm in each pressure vessel [*Accumulator*]. correspond to criteria given in the text above.
5. If necessary, release or add additional air to correct.

Venting Pumps

It is important to bleed all air from the pump body before initial start-up.

Procedure for flooded suction

Flooded Suction is defined as the condition where there is positive pressure on the suction (inlet) side of the pump(s) as is the case where the storage tank water level is at the same or higher level than the pump bleed point.

This procedure should be carried out individually for each pump in the Pumpset.

1. Close any valve on the discharge manifold outlet to the system.
2. Open all valves on the suction (inlet) side of the pump.

3. Using the vent screw at the top of the pump (refer to Appendix A to locate), allow any air in the pump body and suction pipework to vent to atmosphere.
4. When water (under pressure from the storage tank feeding the pump on the suction side) escapes through the vent screw hole - and no more air bubbles can be seen - close the vent screw.
5. Switch on the electrical supply to the pump motor and start the pump in AUTO mode.
   As each motor starts verify that the direction of rotation correctly corresponds with the direction of the arrow shown on the body of the pump. If rotation is backward STOP, switch off the pump and investigate.
6. Slowly open the valve on the discharge manifold outlet to the system allowing water to be pumped into the system.
7. Switch off, re-close the discharge valve and repeat steps 3 to 6 several times to ensure that all air is released from the pump body and local pipework.
8. The above procedure should be carried out individually for each pump in the Pumpset.

Procedure for lift suction

Lift Suction is defined where the water storage tank is at a lower level than the pumpset. In this case a negative pressure condition may exist at the pump suction.

WARNING **The "Lift Suction" mode of operation requires specific venting procedures. Please call *Dutypoint* Technical Support on 01452 300592 for advice before attempting to vent the pump(s).**

The advised procedure should then be carried out individually for each pump in the Pumpset.

Operational and Performance Tests

Having checked that the Pumpset is installed, precharged, vented in accordance with the procedures set out earlier, carry out the following running tests before handing over the Pumpset for operational use.

Duty/Standby sets

1. On Duty/Standby sets, wait for a normal stop to take place (or create the conditions where this would happen) and check that the 'Duty' pump stops.

   Whilst stopped simulate a fault by inhibiting the 'Duty' pump and then recreate the conditions for a normal start to take place.

   Check that the 'Standby' Pump now starts and runs in place of the inhibited 'Duty' pump and observe the pressure values.
2. Wait for a normal stop to take place (or create the conditions where this would happen) and check the 'Standby' pump stops. Whilst stopped undo the inhibit to the 'Duty' pump which should now return to normal.

Duty/Assist sets

1. For 'Duty/Assist' applications, run the system up to pressure using the 'Duty' Pump only, then deliberately create the condition(s) which will require the 'Assist' Pump to operate as well. (e.g: open taps to reduce the pressure in the system to a point where one pump only cannot maintain the required output.

Verify that the 'Assist' Pump starts and runs together with the 'Duty' Pump and that the desired pressure is duly restored and maintained.

2. Close the taps again (thereby reducing the demand) and check the 'Assist' Pump slows down and stops, allowing the 'Duty' Pump to continue on its own.

Commissioning/Handover Check

1. Record any indicated voltage / amperage / pressure data / controller passwords for future reference.
2. Re-check all isolating valves are fully open and replace any cover(s).

With all the isolators ON and the switches and/or control programs set to AUTO, the pumpset is now fully operational in automatic control mode.

NOTE

No manual operation or attendance is required other than for routine servicing and maintenance checks.
Other than for maintenance purposes, the supply to the Controller(s) and the Pump motor(s) should never be switched off

Routine User Maintenance

Dutypoint Pumpsets have been designed to keep major maintenance requirements to a minimum. Planned maintenance of the pumps and other principal components should therefore be undertaken at the intervals recommended in the manuals referenced below.

It is essential that a full test following the Pre-Commissioning procedure on page 30 is carried out on an annual basis.

In addition, the operator in charge should routinely make visual checks of the equipment during use, noting particularly any unusual noises or vibrations. This will give an immediate indication of any irregularity in the operation of the system.

DANGER

DO NOT COMMENCE ANY MINTENANCE WORK UNTIL:
1. YOU HAVE READ THE SAFETY SECTION AT THE BEGINNING OF THIS MANUAL.
2. ARE DRESSED IN THE CORRECT PROTECTIVE CLOTHING.
3. HAVE ALL NECESSARY SAFETY EQUIPMENT TO HAND.

Refer to the appropriate manufacturer's information that is provided in the appendices of this manual for the equipment being serviced.

Recommended user weekly checks

1. Visually check the complete pumpsets system.
2. Observe the running of the pump(s) and note any unusual vibration, etc.

Recommended user quarterly checks

1. Visually check the complete pumpsets system.
2. Observe the running of the pump(s) and note any unusual vibration, etc.
3. Operate each manual isolating valve three times to ensure continued efficient working.

Recommended user 6 monthly checks

The pressure vessel should be drained and the pre-charge pressure checked.

Refer to page 31 of this section for details.

Essential 12 monthly (maximum interval) service

Carry out the full Pre-Commissioning procedure to verify correct safe operation. Refer to page 30 of this section for details.

Detailed Pump Maintenance

Please refer to the Manufacturer's document which you can find in Appendix A and Appendix C of this manual.

Detailed Controller Maintenance

Please refer to the appropriate Manufacturer's document which you can find in Appendix B of this manual.

Detailed Accessory Maintenance

If you have purchased additional accessories for your system, please refer to the appropriate manufacture's document supplied.

5

Troubleshooting

This Section provides general troubleshooting tips applicable to the Dutypoint range of pumpsets.

NOTE **The information in this section is common to all Dutypoint centrifugal pumps. For more detailed troubleshooting information that is specific to the type and model of Pump and Controller used in the VG pumpsets, please refer to the Manufacturer's literature located in the appendices of this manual.**

First Step When a Fault Occurs

When a fault first occurs, turn off the main power to the pumpset and leave off for around 1 minute.

Switching power back on and re-energising the system may be sufficient to clear the fault.

General Pump Troubleshooting

Item/Fault	Possible Cause(s)	Recommended Action
Pump will not start.	1. No electrical power. 2. Blown fuse(s). 3. Overload trip.	1. Check and rectify. 2. Check and rectify. 3. Check and (if necessary) reset the overload trip value. *For Control Panel information refer to Section 3 of this manual.* *For Pump and Controller manufacturer's information refer to the appendices to this manual.*
Low (or zero) output (discharge rate).	1. The rotating part(s) of the pump is(are) partially or completely obstructed e.g: impeller obstructed by foreign matter 2. Pump not primed - WARNING: running the pump 'dry' can cause serious damage to the mechanical seal. 3. Valve in suction pipework closed or partially closed. 4. Incorrect pump rotation	1. Strip the pump to inspect and rectify. 2. Having first checked the mechanical seal for damage, prime and air-bleed the pump and try again 3. Check all appropriate valves are fully open. 4. Check and rectify. *For Pump and Controller manufacturer's information refer to the appendices to this manual.*

Item/Fault	Possible Cause(s)	Recommended Action
Pump vibrates and/or is noisy	1. Pump is cavitating.	1. Increase the discharge back pressure slightly by progressively closing a manual isolating valve on the discharge side until the cavitation stops.
	2. Motor bearings worn.	2. Check and rectify
	3. The rotating part(s) of the pump is(are) partially or completely obstructed. e.g: impeller obstructed by foreign matter.	3. Strip the pump to inspect and rectify. *For Pump and Controller manufacturer's information refer to the appendices to this manual.*
Pump runs continuously	1. If the pump has a "Hand Control" option on it's control panel.	1. Switching to "Auto" should restore normal control. If normal control is not returned an immediate service visit is required.
	2. Pump has no "Hand Control" option.	2. An immediate service visit is required.
Overload Trip	1. Pipework or the pump chamber has a partial blockage.	1. Check and rectify
	2. Momentary loss of one phase of power supply.	2. Check and try again.
	3. Discharge flow rate too high.	3. Reduce by the discharge flow rate by increasing the discharge back pressure slightly, progressively closing a manual isolating valve on the discharge side: then try again
	4. Overload trip setting too low for rated duty	4. Check and (if necessary) reset the overload trip value *For Pump and Controller manufacturer's information refer to the appendices to this manual.*

Technospeed Controller Troubleshooting

If you suspect your problem is possibly caused by the Technospeed Controller, please refer to the troubleshooting information on page 27 of the manufacturer's manual located in Appendix B.

A

Appendix A Manufacturer's Guide - CEA-CA, HM-HMS Electric Pumps

This Section contains a facimile copy of the Installation Safety, Operating and Troubleshooting instructions provided by ITT Lowara for their CEA-CA and HM-HMS Electric Pumps:

- ***General User Guide***
- ***Failure Analysis System Procedure***

LOWARA

cod. 001073056 07/01

GB P-PSA-BG-BGM GARDEN-SP-CE(A)-CA HM-HMS-LQ

Instructions for installation and use - Safety - Declaration of conformity

ITT Industries
Engineered for life

ORGANIZZAZIONE COMMERCIALE ITALIA – *ITALIAN SALES NETWORK*

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GB 1. HANDLING

The product must be lifted and handled with care.

2. APPLICATIONS

Designed to handle clean non-aggressive water free of dissolved gases. For water with moderate gas content, use BG and BGM garden models.

Typical applications.
Domestic water supply, irrigation, pressure boosting, liquid transfer.

3. WORKING LIMITS

- Max. operating pressure: 800 kPa (8 bar), PSA; 1 MPa (10 bar)
- Max. liquid temperature: P, BG, SP, HM: 40°C; CEA-CA-PSA: 85°C, 110°C for ...- V version.
  NOTE: All pump models are suitable for domestic use provided the water temperature does not exceed 35°C.
- Max. ambient temperature: 40°C (for 4045°C see point 5).
- Max. number of starts per hour: 40

4. INSTALLATION

Proper installation (fig. 1)
A = eccentric adapters
B = positive lift
C = good immersion
D = wide bends
E = suction pipe diameter >= pump port diameter
F = suction lift. Depends on pump and installation (*)
G = pipes must not exert stress on pump but on independent supports
H = foot valve (not necessary for SP-BG-SG models).
(*) The suction lift is determined by liquid temperature, altitude, flow resistance and
NPSH required by the pump.
As a general rule, the suction lift is 4 m for the P and C models, and 7 m for the BG and SP models.

Improper installation (fig. 2)
1 = tight bends: high flow resistance
2 = insufficient immersion: air suction
3 = negative lift: air pockets
4 = pipe diameter < pump port diameter: high flow resistance.

5. ELECTRICAL CONNECTION

To connect, proceed as shown on the back of the terminal board cover (anticlockwise rotation) and in fig. 4 for single-phase versions, fig. 5 for three-phase versions. Use standard 3-wire cables (2+ground) for single-phase versions, 4-wire cables (3+ground) for three-phase versions.
The reference characteristics (voltage, frequency and input current) are shown on the pump rating plate.
The single-phase pumps have built-in, automatic reset thermo-amperometric protection; the three-phase pumps must always be supplied through a magneto-thermal overload cutout set to the rated current.
For ambient temperatures of 40 to 45°C, supply cables with temperature characteristics of at least 95°C and minimum wire gauge of 1.5 mm^2 must be used.

Check the direction of rotation (three-phase models only)
Clockwise rotation when looking at pump from the motor side.
Check by looking at the fan or by observing the pump's performance.
The correct direction of rotation is the one that generates the highest Q/H performance. In the event of incorrect rotation, switch two supply wires.

6. PRIMING (Fig. 3)

Fill the pump body and suction pipe through the fill plug, bleeding off all the air. For the SP-BG models, self-priming without the foot valve may require up to 3-4 minutes.
We therefore recommend that you always use a foot valve.

7. MAINTENANCE

The pump should be serviced by qualified personnel only, after having been disconnected from the power mains. No routine maintenance is required.

GB 8. SAFETY INSTRUCTIONS

FIG. 6 Pay attention to the working limits (par. 3). Improper use may damage the pump and other property, and injure people.

FIG. 7 The pump is not suitable for use with flammable or dangerous liquids.

FIG. 8 Make sure that the rated voltage and the mains voltage are compatible.

FIG. 9 The connections to the mains and grounding must be executed by qualified personnel (authorised electrician) in in compliance with local installation standards.

FIG. 10 Connect to the power mains using a multi-pole power switch with a switch- contact gap of at least 3 mm. As additional protection from lethal electrical shock, install a high-sensitivity differential switch (0.03 A).

FIG. 11 Make sure that unauthorized people do not have access to the pump.

FIG. 12 Disconnect the power supply to the electric pump or unplug the machine before carrying out any maintenance, cleaning or handling operations. If the power cord is damaged it must be replaced by qualified personnel to ensure against hazards.

FIG. 13 Use the pump only within the limits specified on the rating plate.

FIG. 14 Do not run the pump with the port closed.

FIG. 15 Be alert to hazardous situations caused by accidental power failure.

FIG. 16 Protect the pump from the weather.

FIG. 17 Caution! Avoid icing.

FIG. 18 Make sure the motor is properly ventilated.
Warning: the motor can reach a temperature of 70°C.

9. TROUBLESHOOTING

THE PUMP DOES NOT START: • Check the power supply. Reset the ground fault interrupter or circuit breaker if it has triggered. • The thermo-amperometric protection incorporated in the single-phase versions may have activated: it will reset automatically once the motor has cooled.

THE MOTOR STARTS BUT THE PUMP DOES NOT DELIVER: The pump is sucking in air: check the liquid level, the tightness of the suction pipe and the operation of the foot valve.

THE PUMP'S DELIVERY IS REDUCED: • Check for throttling and direction of rotation in three-phase models.

THE PUMP STOPS OCCASIONALLY: • Triggering of thermo-amperometric protection (single-phase version) or of temperature relay due to excessive current input: contact an Authorized Service Centre.

10. NOISE

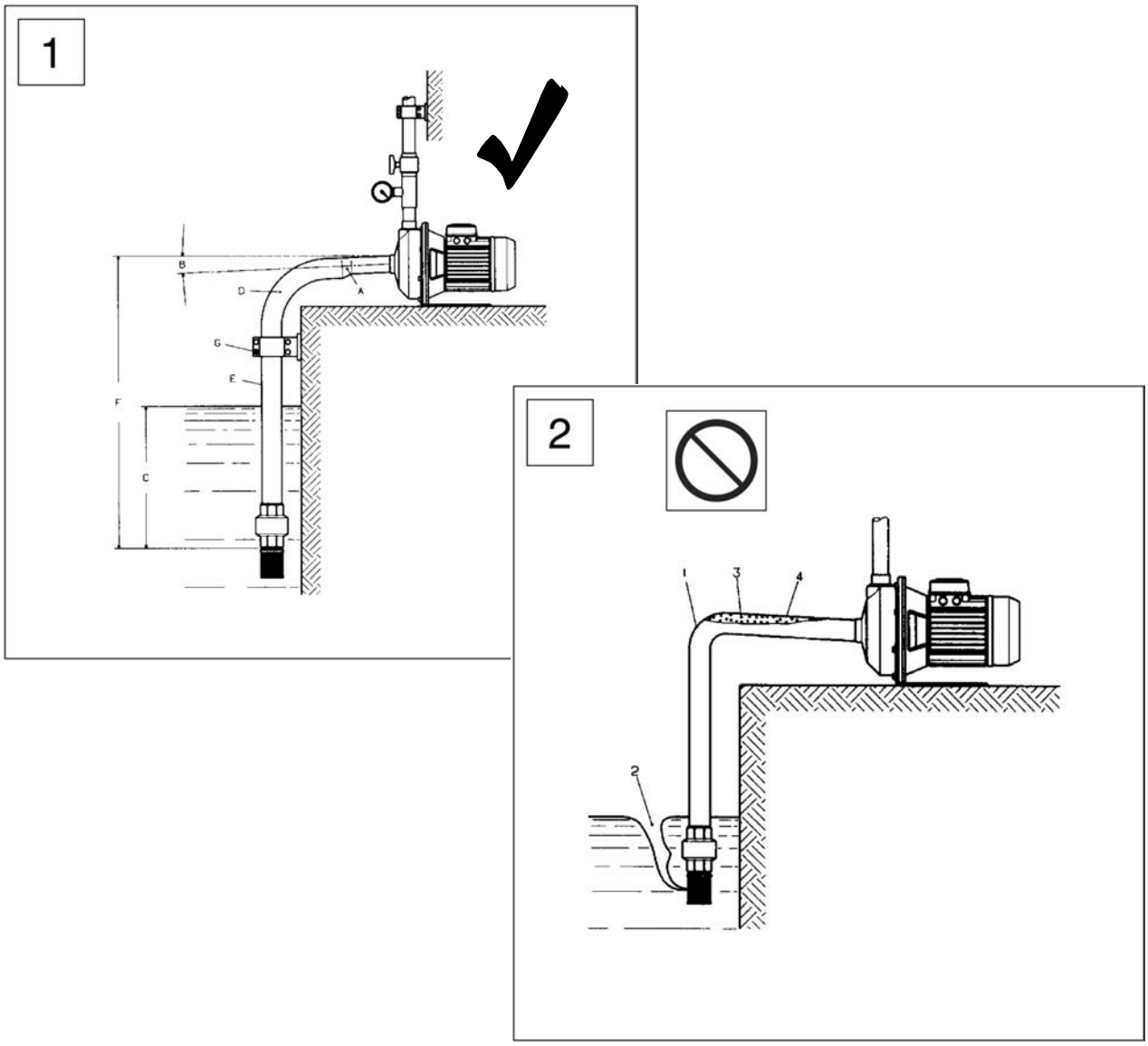
	Acoustic pressure dB(A)
PSA-BG-BGM GARDEN-CEA-CA-HM-LQ (50÷60 Hz)	<70
P16 - P21 - P30 - P40 (50 Hz)	<70
P16 - P21 - P30 - P40 (60 Hz)	73±2
P60 - P70 - SP (50 Hz)	72±2
P60 - P70 - SP (60 Hz)	77±2

11. DECLARATION OF CONFORMITY

PRODUCTS: P-PSA-BG-BGM GARDEN-SP-CEA-CA-HM-LQ
Manufactured by LOWARA – Montecchio Maggiore (VI) – Italy

The products listed above comply with the following Directives:
Machine Directive 98/37/EEC, EN standard 292
Low Voltage Directive 73/23/EEC and related supplements, EN standards 60335-1 and 60335-2-41.
Electromagnetic Compatibility Directive 89/336/EEC and related supplements, EN standard 50081-1 and –2.

SIGNATURE/TITLE: Amedeo Valente (Director of R&D and Engineering)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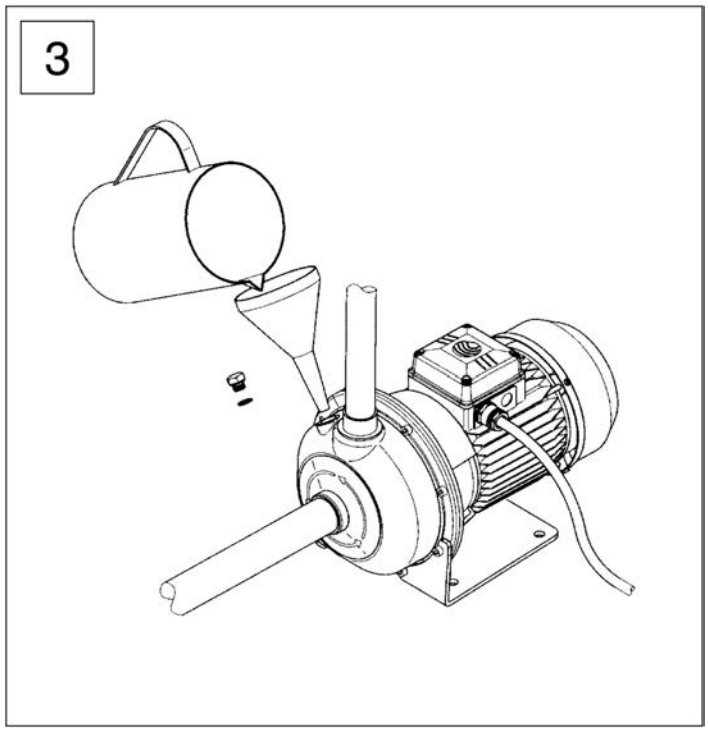
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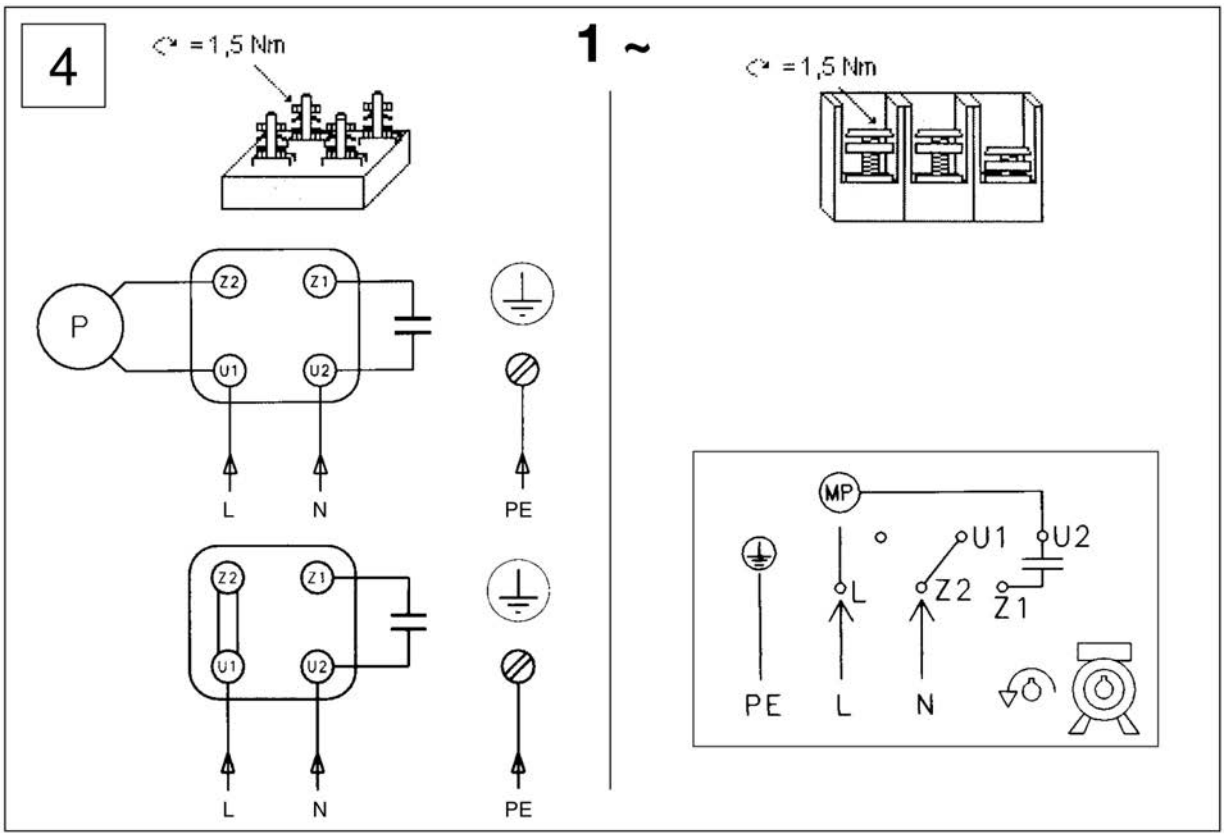
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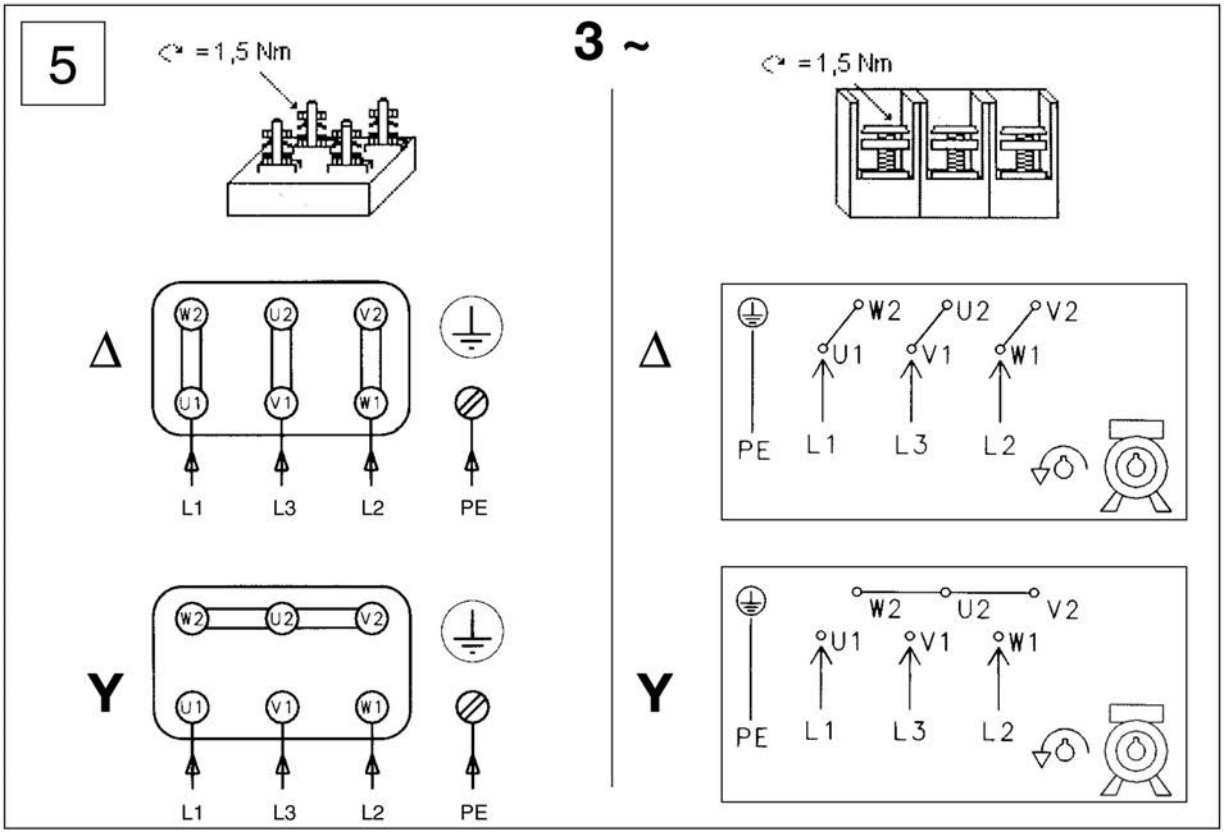
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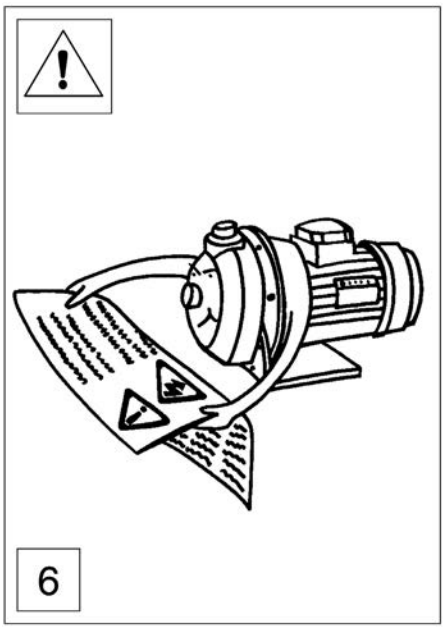
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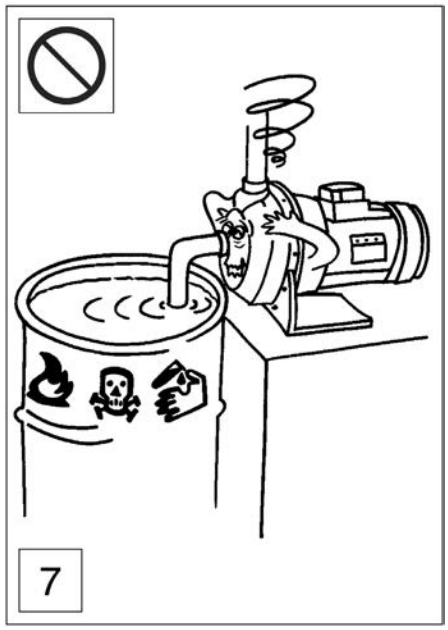
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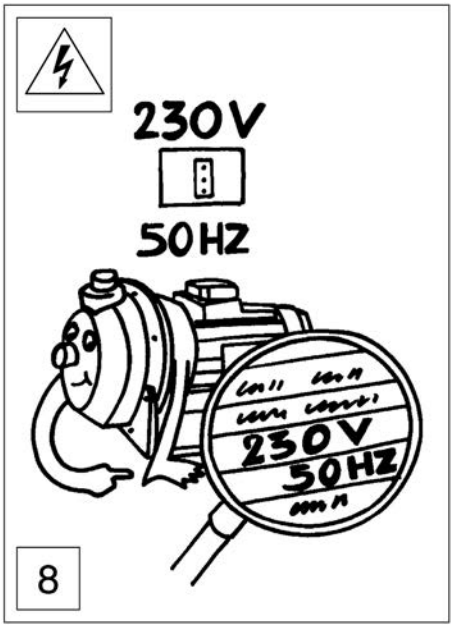
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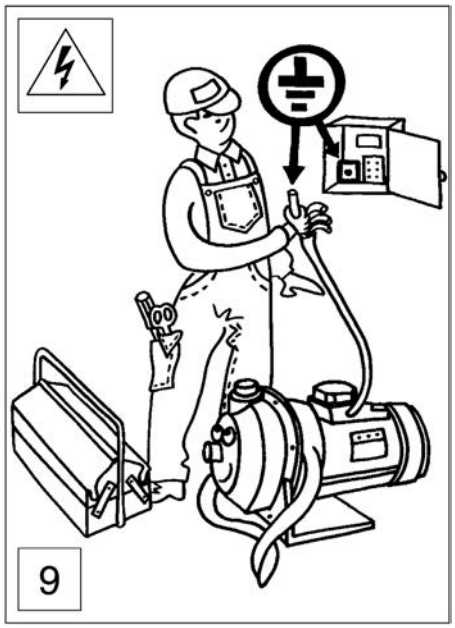
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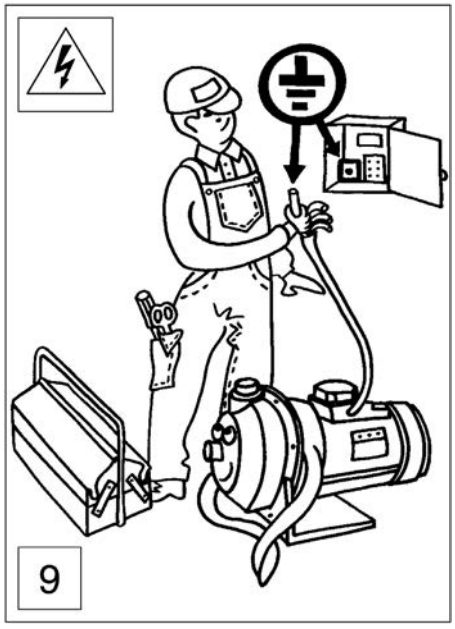
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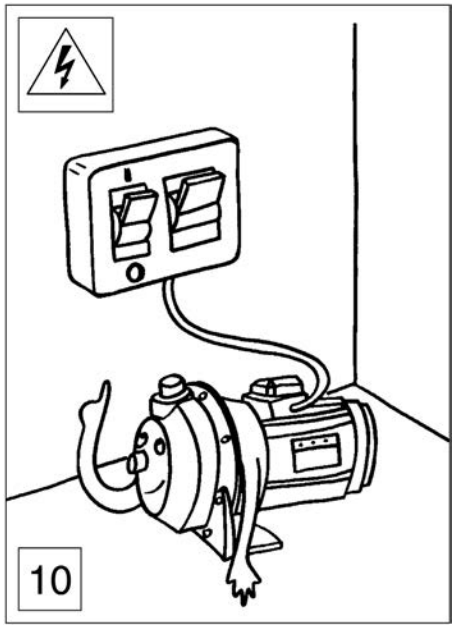
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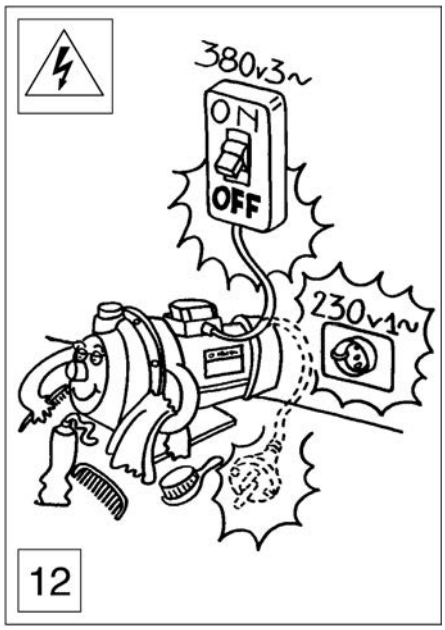
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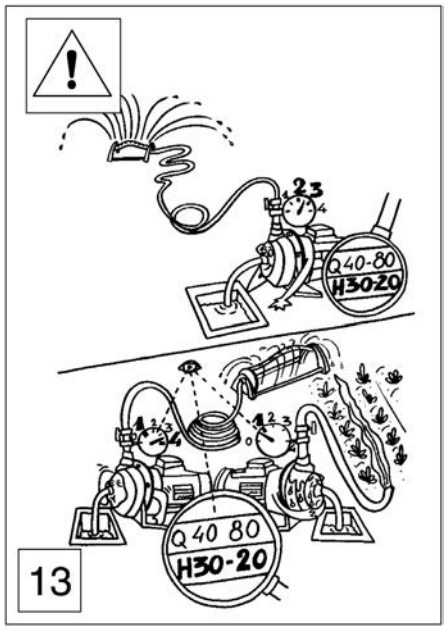
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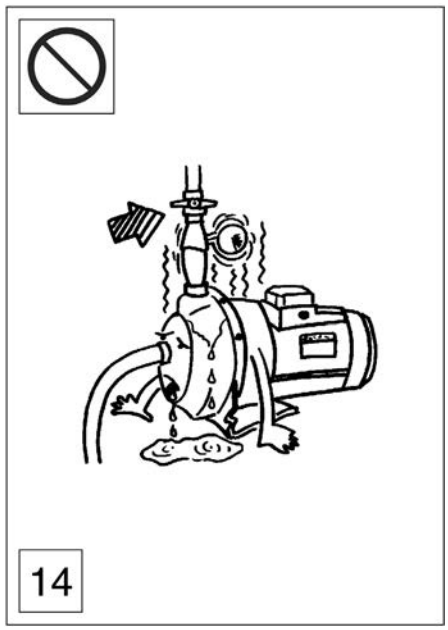
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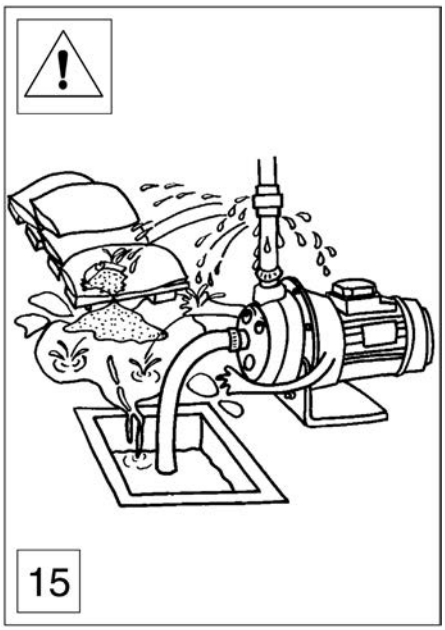
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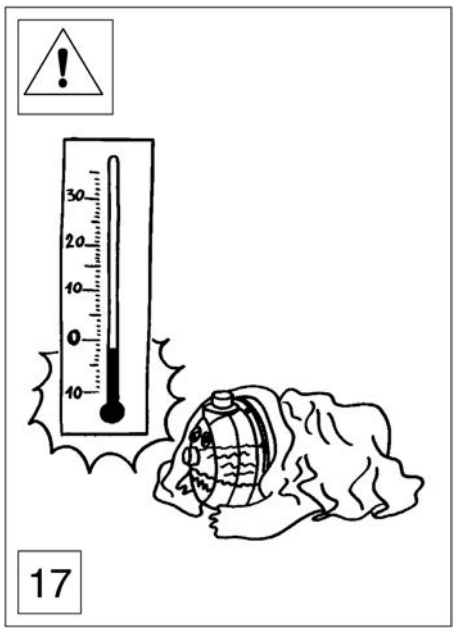

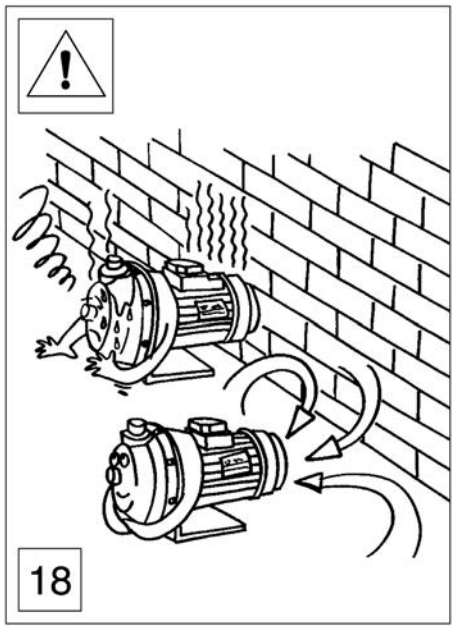

GB *= Hmax(m) **= Type of pump (50 Hz) *** =Type of pump (60 Hz)

*	**	***
12	LQ55T	
13	LQ75-110T	4HMS36T
14	LQ150T	
15		2HMS36T
16	CEA370/1	
17	CEA210/2	CEA2106/0-3706/0
19	4HMS3T	
20	2HMS3T, CEA370/2	CEA3706/0A
21	CEA210/3	CEA2106/1
22	CEA70/3-120/3	
23		2HM36T, 4HM46T, CEA3706/1
24	2HM3T, 4HM4T, CEA370/3	CEA1206/1
26	CEA210/4	CEA2106/2
27		4HMS56T
28	4HMS4T	CEA1206/2
29	CEA210/5	
30	2HMS4RT	2HMS46T, CEA2106/3
31	CEA70/5	
32	CEA80/5-120/5	CEA706/3
33		CEA1206/3
35		2HM46T, 4HM56T
36	BG3, BGM3 GARDEN, 2HM4T, 4HM5T	P16
37	4HMS5T	

*	**	***
39		CEA706/4
40	2HMS4T	4HMS96T, CEA1206/4
41	BG5, BGM5 GARDEN	BG56
43	P16, SP5T, CA70/33-120/33-200/33	
45		CEA706/5
46	BG7, BGM7 GARDEN, 4HMS7T	2HM56T, 4HM76T, 2HMS76T
47	2HM5T, CA70/34	BG76
48	P21, 4HM7T	P21
50	BG9, BGM9 GARDEN, 2HMS7T	P30
52	CA200/35	SP56T
53	SP7T, BG11, BGM11 GARDEN, CA120/35	BG116
55	CA70/45	
56	P30	P40
58		2HM76T, 4HM96T
59	2HM7T	
60	4HM9T	
61	CA200/55	2HMS96T
62	CA120/55	SP76T, CA706/33-2006/33
63	P40	CA1206/33
77	P60	P60
85		P70
95	PSA70	PSA706
100	P70	

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Failure Analysis System Procedure

CEA-CA, HM-HMS Electric Pumps

1) Electric pump applications

CA-CEA made with AISI 304 and HM
- Pumping of water and liquids chemically and mechanically not aggressive.
- Water storing;
- Irrigations;
- Water circulation (cold, hot, chilled)

CA-CEA made with AISI 316 and HMS
- Reverse osmosis
- Industrial washings
- Swimming pool
- Gold industry
- Wine production

2) Critical items of application

2.1) Electrical supply:
- In running condition, max variation of supply voltage: ± 10%.
  - a too high voltage generates overheating and overload;
  - a too low voltage generates starting problems.
- Max frequency of start: 40 start/h
  - an excessive number of starting generates overheating and overload of motor;
  - frequents start and stop of pump can generate a rupture of the motor tie rods.

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2.2 Liquid

• Pumps made in standard configuration must pump clean water or condensate.
Temperature limits and standard configurations:
- CEA-CA pumps: -10°C, +85°C, with mechanical seal ceramics/coal/NBR;
- CEA(N)-CA(N) pumps: -10°C, +85°C, with mechanical seal ceramics/coal/EPDM;
- HM pumps: -10°C, +60°C, with mechanical seal ceramics/coal/EPDM;
- HMS pumps: -10°C, +110°C, with mechanical seal ceramics/coal/EPDM.

• In case of applications with bigger range of temperature and pumping of other liquids, pumps must be configurated with attention.
Main configurations realized, based on the type of application, are wrote in the following table:

Application	Advised seal (*)	Note
Deionized water	Silicon carbide/Special coal/EPDM oFPM	Suitable for waters witch have just undergone by process of direct or reverse osmosis
Demineralized water	Silicon carbide/Special coal/EPDM oFPM	
Pasteurizing systems	Ceramica/Coal/NBR or FPM or EPDM	Pumping of water with Tmax ≤ 100°C
Washing of systems for the food industry	Widia/Special coal/EPDM	Mixture of water and hard caustic: max conc. 20%, Tmax 80°C.
Generics washing systems	Widia/Special coal/EPDM	Products to alkaline base with Ph between 8 and 10. For greater Ph it is advised Widia/Silicon carbide/EPDM
Refrigeration systems	Widia/Special coel/EPDM or Widia/Silicon carbide/EPDM	Mixture of water and glycol with concentration from 10% to 100% and temperature from -55°C to +40°C
Transfer/pumping of generic chemical products	It is advised to contact the sale net	Large tipology of acids

(*) Rotating part/fixed part/O-Ring

• If is pumped an abrasive liquid with CEA pump, it is advised to use the pump with the seal holding disc without the 3 indents.
• Pumping of diesel oil or others inflammable liquids is concurred only with use of special version pumps and equipped with Atex motor.
• Pumping of sea water, brackishwater or with a great concentration of chlorine is not adviced because of priming of corrosive phenomena in hydraulic part.

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2.3) Installation:
• Max environement temperature: 40°C.
• Max operating pressure: 8 bar.
• Installation of pump inside of environements with a great humidity causes damaging of motor bearings.
• If the pump is used in refrigeration systems, it is advised to remove the condensate evacuation plugs of the motor for facilitate her evacuation.
• In case of pump with negative water head, or in case of pumping of hot liquids it is necessary check the difference in height between the axias pump and the level of water can guarantee the correct working of pump without cavitation (check NPSH value).
• Pump must never operates without water to avoid damages of mechanical seal and hydraulic part.
• The pump mustn't operates when the delivery outlet is closed (overheating of pumped liquid and motor).

• 1~ motors with power until 1.5 kW of CEA-CA pumps and 1~ motors of HM-HMS pumps have an internal motor protection but they cannot operate without a operator supervision or insertion of additional protections inside of control board.
• For 1~ motor with power >1,5 kW of CEA-CA pumps and all 3~ motor, must be protect with a circuit breaker installed by a Customer (it is adviced use of Lowara control board).
• It is necessary guarantee a correct air flow to cool the motor. It is necessary the ventilation grid is not partially or totally obstructed; otherwise it generates overheating and overload of motor.
• Pump must be positioned correctly so that permit the disassembly of the motor and the hydraulic part without remove the pump body from pipe so that performe ease an inspection.

• Pump must be positioned and anchored to a plane surface. Moreover, suction and delivery pipes must be anchored to a wall and they mustn't charge to pump body; otherwise, suction and delivery pump cupling can break.
• It is necessary insert a non return valve inside of delivery for protect the pump from water hammer and reverse rotation.
• To get a correct priming of pump, in starting condition, it is necessary to fill the pump body and the delivery pipe with water; otherwise, the performance will be low and will generates damages of hydraulic part.
• If the performances of pump are greater than witch previewed, or if it pumps a dense, viscous liquids, is possible change their by turning of impeller.
• Normally the pump is installed with horizontal axis; it can be installed with vertical axis too, but the motor must be positioned over the hydraulic part to avoid the contact with water (in case ok leaks) or condensate witch can be on the pump body.

2.4) Operation with inverter
• Operation with inverter positioned inside of the control board not present particular limits (see the inverter handbook).
• Installation of our equipment TKS directly is possible only for 3~ pump with power until 1.1kW.

3) Equipments and tools required

• Megaohmeter 500 - 1000 Vdc;

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4) Inspection of defected product

4.1) Preliminary information
On receving of defective product, requirements from Customer:
• purchase date (if possible, confirmed by bill or sale slip);
• installation date;
• conditions of installation and operating.

4.2) External visual inspection
Check the external condition of product, in a particular manner check on the surface of pump body the presence of weld defects, and integrity of aluminum motor casing.

4.3) Preliminary inspections
• Data in plate:
- type of product and code;
- series number;
- manufacturing date;
• Based on type of application witch is subject the pump, check if the configuration is right or wrong (see the table in 2.2).
• Condition of capacitor (if present) and connections on terminal board.

4.4) Electrical resistence of windings
Check electrical continuity of windings and find possible interruptions or burnings.

4.5) Measure of insulation resistance
Performed in accordance with european standard EN 602 04-1 (500 Vdc between conductors and ground).
Test is passed if insulation resistance is ≥ 10 MΩ.

5) Disassembly and analysis

N.W. The pictures refer to HM pump.
• Remove the protection grid, depending on the motor type, extract the fan with 2 screwdriver or unsrew the screws on the hub and check:
- the condition of fan;
- the free rotation of the shaft with screwdriver.

• Unscrews the screws, remove the pump body (HM-HMS-CEA) or suction flange (CA) and check:
- conditions of his internal surface (presence of wear, defects of welds);
- the presence of initial disc inserted for interference (this disc is necessary to keep close the stages in the HM-HMS pumps);
- conditions of O-Ring positioned between pump body and suction flange (CA);
- the presence of foreign matters.

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• Unscrew the lock nut and extract one by one the stages (diffuser + impeller) and check:
- the presence of wear or defects of welds (stainless steal impellers);
- presence of wear in the bush of plastic impeller (HM).

• Remove O-Ring from his seat (on seal holding disc):
- check the presence of wear or cuts.
• Extract the mechanical seal from shaft, taking care of not damage it, and remove the seal housing:
- check condition of her surface and condition of wear;
- positioning of fixed part of mechanical seal on the seal holding disc (if the mechanical seal is not positioned correctly, it reduces her operating life and her efficiency);
- if inside of CEA pumps there are the three indents on the seal holding disc, check their wear condition (possible wear indicates the pumping of abrasive liquid).

• Extract the rotor and check the conditions of bearings.

• Performe an heads visual analysis for finding possible problems with following cases:
a) all motors:
- one or more winding coils burnt ----> shorted coil;
b) 1~ motor:
- run winding OK and start winding KO ----> capacitor defected;
- run winding KO and start winding OK ----> motor could not start;
- both windings faulty ----> overload;
c) 3~ motor:
- 1 phase fine and 2 phases burnt ----> powered with only 2 phases;
- all phases burnt ----> overload;

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6) Check list

Type of problem

- ☐ Does not delivery water
- ☐ Low performance
- ☐ Does not starts
- ☐ Noisy
- ☐ Grounded motor
- ☐ Excessive power input
- ☐ Runs slowly
- ☐ Further:

Pump data

Type:
Code:
Series number:
Installation date:
Manufacturing date:
Liquid pumped:
Temperature:
Note:

CEA-CA-HM-HMS pumps failure causes required for claim opening

Where	What	Why	
100 Electric motor	100 Flooded/full of water	106 Uncorrect assembly/testing of components	
		110 holes of drain condensate, obstructed/closed	
		111 Pinched gasket screws	
		112 Not complying components tooling	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
100 Electric motor	101 Excessive power input / overheating / burnt	102 Motor shaft locket	
		104 Wrong internal electrical connections	
		106 Uncorrect assembly/testing of components	
		107 Bursted / unconnected capacitor	
		108 Short circuit for contact with mobile parts	
		109 Short circuit between coils/windings	
		114 Hydraulic rotating part locked	
		115 Presence of external matters between windings	
		100 Further (supply detailed description of failure)	
		121 Inadequate power supply	
		103 Not complying/unsuitable applications	
		113 Inadequate size of motor	
		116 Inadequate cooling	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
100 Electric motor	102 Runs slowly / does not st	106 Uncorrect assembly/testing of components	
		107 Bursted / unconnected capacitor	
		117 Defected/wrong rotor	
		118 Not operating level sensors	
		119 Water full level sensors	
		100 Further (supply detailed description of failure)	
		121 Inadequate power supply	
		103 Not complying/unsuitable applications	
		113 Inadequate size of motor	
		101 Further:	
100 Electric motor	103 Does not stops	105 Defected/not operating electrical/electronic components	
		118 Not operating level sensors	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		101 Further:	
101 Motor shaft	104 Noisy / locked / vibrate (ok windings)	102 Locked motor shaft	
		106 Uncorrect assembly/testing of components	
		112 Not complying components tooling	
		114 Hydraulic rotating part locked	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	

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101 Motor shaft	Shaft / toothing jut	112 Not complying components tooling	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
101 Motor shaft	401 Broken/cracked	112 Not complying components tooling	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
200 Control device	200 Not operate	105 Defected/not operating electrical/electronic components	
		200 Lack of technical / commercial information	
		118 Not operating level sensors	
		119 Water full level sensors	
		100 Further (supply detailed description of failure)	
		121 Inadequate power supply	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
300 Total hydraulic	300 Low performance	106 Uncorrect assembly/testing of components	
		112 Not complying components tooling	
		300 Wrong rating plate/packing	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
300 Total hydraulic	104 Noisy / locked / vibrate	106 Uncorrect assembly/testing of components	
		112 Not complying components tooling	
		114 Hydraulic rotating part locked	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
403 Pump sleeve	400 Leak	106 Uncorrect assembly/testing of components	
		112 Not complying components tooling	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
404 OR/Mechanical seal	400 Leak	106 Uncorrect assembly/testing of components	
		112 Not complying components tooling	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
408 Pump shaft/joint	401 Broken/cracked	106 Uncorrect assembly/testing of components	
		112 Not complying components tooling	
		100 Further (supply detailed description of failure)	
		103 Not complying/unsuitable applications	
		119 Normal wear	
		120 Excessive wear	
		101 Further:	
600 Product	600 Wrong rating plate packing	106 Uncorrect assembly/testing of components	
	601 Wrong product document	200 Lack of technical / commercial information	
	602 Not acknowledgment of warranty	600 Out of legal warranty period	
		601 Product tampering	

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8) Faq

Problem founded	Possible causes of the problem
Pump does not start	Power supply problems: • no power; • unconnected or damaged cable; • supply voltage too low; Hydraulic locked. Fuses burnt. Circuit breaker tripped/not calibrated. Capacitor too small or damaged (1~ motor). 2 phases powered (3~ motor). Motor is burnt because of insulation defected, overheating or overload (unsuitable liquid)
Pump does not delivery water	Non return valve clogged Delivery outlet obstructed because of foreign matters; Not primed pump. Pump operates in cavitation
Incorrect performance	Delivery outlet partially clogged Pump run in the opposite way Pump is undersized Wrong size of the motor Wrong diameter of pump impeller Clogged non return valve Unsuitable liquid (density or specific weight) Wear of hydraulic part Difference in height and/or flow resistence too highs System leaks
Noisy	Pump operates in cavitation condition Pump is primed incorrectly Motor bearings damaged cause by condensate Presence of foreign matters
Runs slowly	Run and start windings exchanged on control panel (1~ motor) Wrong windings connections inside the motor (3~ motor)
Grounded motor	Generation of condensate inside of the motor Insulation defected Presence of foreign matters (swarfs or bolts and screws)

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Excessive power input	Uncorrect voltage Windings defected Motor supplied with 2 phases instead of 3 (3~ motor) Unsuitable liquid Wrong size of impeller/motor Defected pump Defected bearings Too high frequency of startings
Hydraulic locked	Unsuitable liquid Presence of foreign matters inside of the pump Tolerance of tooling beyond the limits O-ring out of seat
Overheating/overload	Too high pumped liquid temperature Too high frequency of startings Wrong supply voltage Wrong size of pump/motor Defected pump Thrust bearings damaged/seized Lack of adequate protection inside of control board (for motors without internal protection, see 2,3) Lack of ventilation of the motor Too high environment temperature

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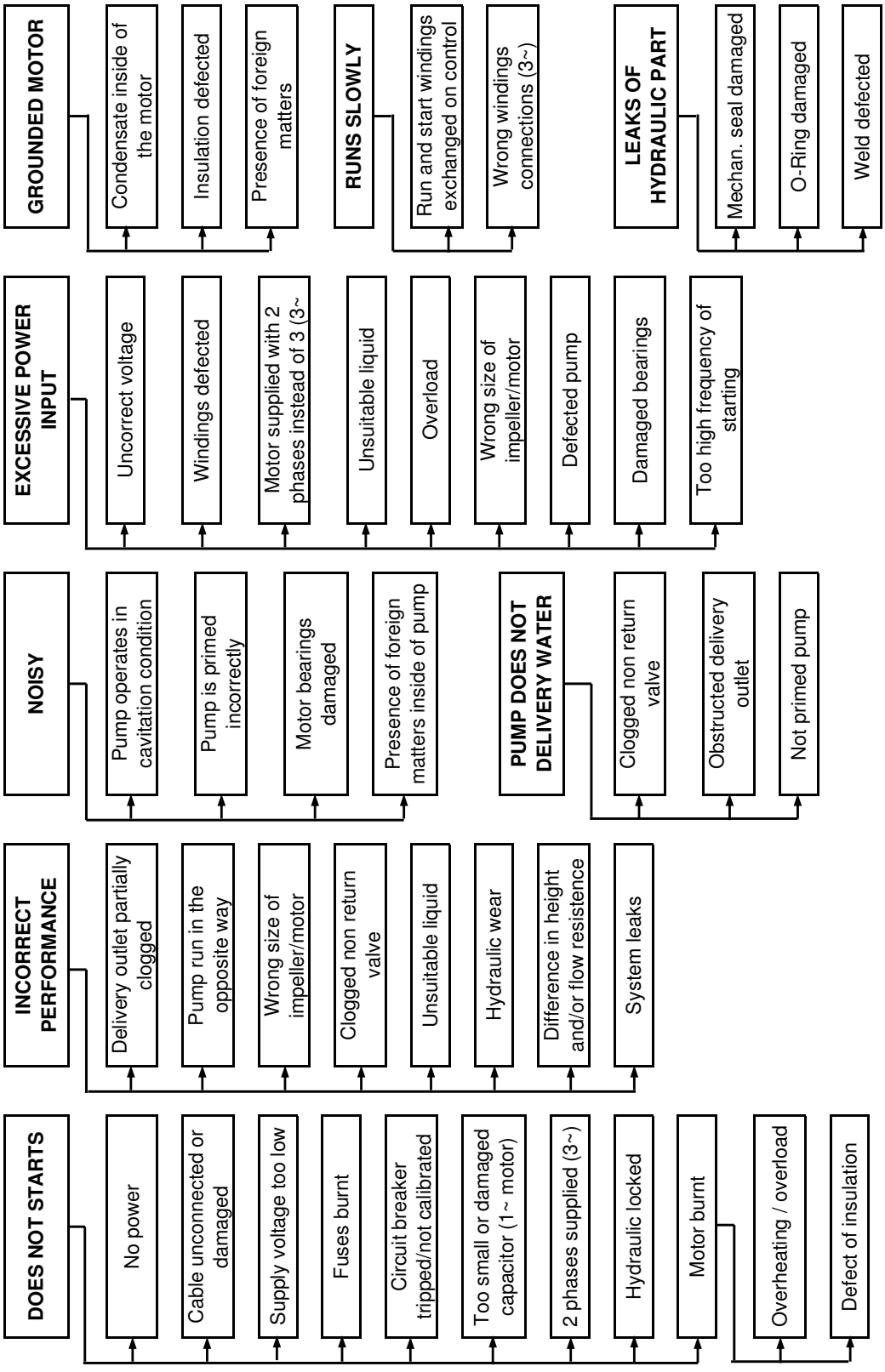
7) Failure tree (CEA-CA-HM-HMS pumps)



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Appendix B Manufacturer's Guide - Teknospeed

This Appendix contains a facimile copy of the Installation Safety and Configuration instructions provided by ITT Lowara for the Teknospeed® Controller.

- ***Instructions for Installation and Use***
- ***Troubleshooting***

TKS SERIES ELECTRIC PUMP WITH TEKNOSPEED SPEED VARIATOR

Instructions for installation and use

Keep this manual for future reference

Page numbers below refer to manufacturer's original manual

1 Overview ..... page 19
2 Preliminary inspection ..... page 19
3 Applications ..... page 19
4 Working limits ..... page 19
5 Installation ..... page 20
6 Start-up ..... page 21
7 Maintenance ..... page 26
8 Troubleshooting ..... page 27
9 Spare parts ..... page 30
10 Disposal ..... page 30
11 Warranty ..... page 30

Page numbers below refer to this Dutypoint manual

12 Tables and drawings ..... page 71
13 Declaration of conformity ..... page 82

English **en**

1. Overview

The purpose of this manual is to provide the necessary information for proper installation, operation and maintenance of the TEKNOSPEED converter connected to a LOWARA electric pump.

Read this manual before using the product.

Improper use may cause personal injury and damage to property, and lead to the forfeiture of the warranty coverage.

For information regarding the electric pumps, refer to the relevant manuals.

The instructions and warnings provided below concern the standard version.
Please refer to the sale contract for any modifications or special version characteristics.
Always specify the exact model identification code and construction number when requesting technical information or spare parts from our Sales and Service department.
For instructions, situations or events not considered in this manual or in the sale documents, please contact our Service Center nearest you.

2. Preliminary Inspection

2.1 Visual Inspection

Upon delivery, check the integrity of the packaging.
If the packaging is damaged, unpack the product and inspect it visually to make sure it has suffered no damage during transport.
Should the product be damaged, inform our dealer within 8 days from delivery.

2.2 Handling and Storage

The product is delivered in a cardboard box or wooden case. During transport and storage, protect it from humidity, heat sources and possible mechanical damage (impacts, falls, etc). Lift and handle the product carefully using suitable hoisting equipment.
Refer to chapter 4 for further information.

3. Applications

The TKS system consists of a three-phase electric pump, the TEKNOSPEED single-phase converter and an electronic pressure transmitter (also known as pressure sensor).
The TEKNOSPEED single-phase converter is suitable for the control of a three-phase electric pump according to the conditions described in this manual and the supply voltage / frequency specified in the rating plate.
The converter controls the operation of the pump in order to ensure a constant delivery pressure based on the signal received from the electronic pressure transmitter.
The TKS system can be used for domestic water supply, irrigation and pressure boosting applications.
For further information refer to chapter 12.

4. Working Limits

For storage :

- Ambient temperature: -5°C to +40°C .

For operation :

For information regarding electric pumps refer to the relevant manuals.

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4.1 TKS system (TEKNOSPEED mounted on the electric pump)

Do not use the product in environments where corrosive and/or flammable powders, acids, gases, etc. are present.
Do not use the electric pump to handle dangerous or flammable liquids.

- Ambient temperature: +0°C to +40°C
- Maximum relative humidity : 50 % at + 40°C provided no condensation occurs
- Maximum height above sea level: 1000 meters
- Protection class : IP 55 (if installed on motors with at least IP55 protection)
- Maximum operating pressure : refer to the operating instructions for the electric pump
  The standard version features a transmitter with 10 bar full scale (chapter 4.2)
- Temperature of pumped liquid : + 1°C to + 40 °C
- Nature of pumped liquid : water containing no chemically aggressive substances or suspended solids
- Maximum rated power of electric pump connected to the converter : 1.1 kW
- Converter supply voltage : 1 x 230 V ± 10 % 50/60 Hz
- Converter output voltage (corresponding to the motor supply voltage) :
  3 x 230 V ± 10 % 12-50 Hz (these values vary according to the converter's voltage/frequency curve)
- Converter's rated input current : 6.8 A
- Converter's rated output current: 4.6 A
- Maximum number of starts per hour, evenly distributed : read the operating instructions for the electric pump

4.2 Pressure transmitter

The sensor for this transmitter is a piezo-resistive silicon element which is sensitive to pressure. It is mounted on a small flexible printed circuit (TAB) and is immersed in an oil chamber. The pressure is transmitted to the sensor through a steel diaphragm located in the oil chamber.

- Pressure range : 0 to 10 bar
- Power supply : 21 Vdc from TEKNOSPEED
- Output signal : 4 to 20 mA
- Connection : 1/4" male, made of nickel plated brass
- Electrical connector : removable, provided with 2-meter shielded cable
- Protection class : IP 55

For ambient conditions other than those specified above, please contact our Sales and Service Department.

5. Installation

Information for installers

The installation operations must be carried out by skilled and qualified personnel.
Use adequate equipment and protections. Observe the accident prevention regulations in force.

Before proceeding with the installation, read these operating instructions and the manual for the electric pump.

If the product shows evident signs of damage, do not proceed with installation but contact our Customer Service Center.

Install the product in a sheltered location protected from the weather and freezing temperatures; observe the working limits in order to guarantee adequate motor cooling. For further information refer to chapters 4 and 12.

Observe all the safety standards and accident prevention regulations in force.

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6. Start-up

Information for installers

The start-up operations must be performed by skilled and qualified personnel. Use adequate equipment and protections. Observe the accident prevention regulations in force.

Before starting the unit, read these operating instructions and the manual for the electric pump.

6.1 Hydraulic Connection of Electric Pump

The hydraulic connections must comply with current standards and legislation.

The product can be connected directly to the municipal water system or the water can be taken from a storage tank.
In case of connection to the municipal water system follow the regulations locally in force (issued by City, utility company, etc.). We suggest that you install a pressure switch on the suction side for deactivation of the electric pump in the event of low water system pressure (protection against dry running).

Make sure that the water system pressure added to the maximum pressure of the pump does not exceed the maximum operating pressure value (nominal pressure NP) allowed for the pump.

For example, if the system features a CA 70/33 pump we can calculate that :
Maximum head of the pump :
43 meters (equivalent to a closing contact pressure of approximately 4.3 bar)
Maximum working pressure allowed :
8 bar (NP 8)
Water system pressure (consider the maximum value):
1.5 bar
Resulting maximum working pressure :
4.3 + 1.5 = 5.8 less than the 8 bar limit

When using a storage tank it is necessary to install a float switch for deactivation of the electric pump in the event of low water (protection against dry running).

You must install a pressure gauge on the delivery side as it may be necessary to modify the factory settings based on the actual installation conditions.

To complete the system, flexible pipes on suction and delivery side, on-off valves on suction and delivery side, non-return valve and surge tank with diaphragm are normally installed. To avoid having to drain the system in the event that the diaphragm tank or the pressure gauge or the pressure transmitter need replacing, we advise you to install on-off valves.
If you install a check valve on the pump's delivery side, position the pressure transmitter downstream from the valve. We advise you to install a test tap to be used during the TKS system's calibration stage (chapter 6.3.3) unless a water drawing point is already present in the vicinity of the pump .
For further information refer to chapter 12.

6.1.1 Surge Tank (Diaphragm Tank)

A diaphragm tank must be installed on the delivery side of the electric pump to maintain pressure in the system when there is no water demand, in order to prevent continuous pump operation.
With the TEKNOSPEED converter there is no need for a large capacity tank. The nominal capacity of the tank, in liters, must be at least 5% of the maximum flow rate (liters per minute) of one pump, with a minimum of 8 liters of nominal capacity.

Example : maximum flow rate of pump = 60 liters per minute
nominal volume of tank = 60 x 0.05 = 3 liters → 8 liters
maximum flow rate of pump = 150 liters per minute
nominal volume of tank = 150 x 0.05 = 7.5 liters → 8 liters

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Make sure that the surge tank can handle the maximum pressure of the system.

Check and adjust the precharge pressure before connecting the surge tank to the system.
If the surge tank is already connected, you will have to drain the system before you check and adjust the precharge pressure. To avoid doing this, we suggest that you install an on-off valve between the connection to the tank and the system's pipe.
To determine the precharge value for the surge tank you can use the following formula:
if in bar → work pressure – 0.2 = precharge pressure
if in kPa → work pressure – 20 = precharge pressure

6.2 Electrical Connection of Pump

The electrical connections must comply with current standards and regulations.

Make sure that the type of power source, the supply voltage and frequency match the ratings of the TKS system shown in the rating plate. Provide suitable general protection against short circuits on the electrical power line.

WARNING : although the TKS system has single-phase power supply, the pump's motor is always a three-phase motor connected to 230 V. The missing phases are created by the converter. For further information refer to chapter 12.

Before proceeding with these operations, make sure that all the connections (even those that are potential-free) are voltage-free. Always disconnect the TEKNOSPEED converter from the power supply before carrying out any operations on the system's electrical or mechanical components.
After disconnection from the power source, wait at least 1 minute before carrying out any work on TEKNOSPEED to allow the condensers in the internal circuit to discharge.

6.2.1 Differential Magneto-thermal Switch

If local regulations require the installation of a differential magneto-thermal switch, make sure it is of a type that is suited to the system. Suitable switches are those having the characteristic curve for unidirectional alternate and pulsating DC fault current (type A or C).

They can be identified by the presence of the following symbol:

6.2.2 Version with Cable and Plug

The TKS system is equipped with power cord and plug.

When installing the pump, make sure that the plug and corresponding outlet are easily accessible in case the system needs to be deactivated.

If the power cord is damaged, it must be replaced at a service center or by qualified personnel.

6.2.3 Input Filter

The TEKNOSPEED converter is equipped with an input filter according to the EMC directive.

6.2.4 Motor Overload Protection

The TEKNOSPEED converter has an incorporated overload protection which guarantees absolute protection when it is connected to motors featuring the same nominal protection as that of the converter. For lower power motors an auxiliary protection is used (see chapter 6.2.5)

6.2.5 Motor Overtemperature Protection (PTC)

Some models may feature an extra protection (thermistor) in addition to the overload protection incorporated in the converter. The thermistor (PTC) is attached to the base of the terminal board and connected through cables and mini-fastons. The corresponding dip-switch will be in the PTC Y position.
For further information refer to chapter 12.

6.2.6 Converter overtemperature protection

The TEKNOSPEED converter has an incorporated overtemperature protection.

6.2.7 Protection against dry running (float switch)

The TEKNOSPEED converter can be connected to an external device for protection against pump dry running (see chapter 6.1). The most conventional method consists in the use of a float switch installed in the suction tank.

To connect the cable of the external device you must remove the converter's radiator using a no. 5 Allen wrench (maximum torque 6 Nm). Turn the radiator upside down, paying attention to the connections with the removable terminal board. The terminal board may have to be extracted. Replace an M 16 x 1.5 plug with one of the cable glands supplied. Lay the float switch cable and connect it to the terminals corresponding to LOW 1 and LOW 2 (suitable for 0.5÷1 mm^2 conductors). Screw down the cable fastening plate and tighten the cable gland to secure the cable. If you connect the suction side of the pump to the municipal water system, you can use a pressure switch that opens its contact when the pressure drops below the set point.

If you are not using any device, two terminals must be connected with a jumper.

Use the slotted blade screwdriver (2.5 mm) provided with the TKS system for the connections on the converter's terminal board.

For further information refer to chapter 12.

6.2.8 External Enable Device

You can connect a switch instead of the float switch (chapter 6.2.7). This external device can be used to enable or disable the system. We recommend using a shielded cable. The stripping of the cable should allow the shielding to be in contact with the cable fastening plate.

Use the slotted blade screwdriver (2.5 mm) provided with the TKS system for the connections on the converter's terminal board.

For further information refer to chapter 12.

6.2.9 Alarm Relay

The TEKNOSPEED converter has a contact that can be used to obtain an external shutdown or malfunction signal.

This contact is closed when

• the pump is not running due to one of the following causes : no voltage
motor overload (chapter 6.2.5)
motor overtermperature (chapter 6.2.6)
converter overtemperature (chapter 6.2.7)
Probe faulty or disconnected (chapter 6.2.11)

• lack of water on suction side (chapters 6.2.8 and 6.2.9)

To connect the cable you must first take the radiator off the converter using a no. 5 Allen wrench (maximum torque 6 Nm). Turn the radiator upside down, paying attention to the connections with the removable terminal board. The terminal board may have to be extracted. Replace an M 16 x 1.5 plug with one of the cable glands supplied. Lay the cable and connect it to the terminals corresponding to COM and NC (suitable for 0.5÷1 mm2 conductors). Screw down the cable fastening plate and tighten the cable gland to secure the cable.

We recommend using a shielded cable. The stripping of the cable should allow the shielding to be in contact with the cable fastening plate.

Use the slotted blade screwdriver (2.5 mm) provided with the TKS system for the connections on the converter's terminal board.

For further information refer to chapter 12.

6.2.10 Serial Interface

The TEKNOSPEED converter is equipped with a serial interface that can only be used on pumping systems with two pumps.

Do not connect any wires to the COM, TX, RX terminals of the serial interface.

For further information refer to chapter 12.

6.2.11 Pressure Transmitter

The TKS system comes with pressure transmitter connected to the TEKNOSPEED converter's terminal board. The transmitter is equipped with a 2-meter shielded cable. If you need to wind up the cable, do not coil it but fold it .

For further information refer to chapter 12.

6.2.12 Regulation Dip-switches

The TEKNOSPEED converter is equipped with a series of microswitches (dip-switches) that determine its operating cycle.

Do not modify the factory setting; you could damage the converter or the system on which it is installed.

For further information refer to chapter 12.

6.3 Initial Start-up

6.3.1 Priming

Read the operating instructions for the electric pump.

Fill the pump and suction pipes with water before starting the system. Dry running can damage the pump.

Start the system with the on-off valve on the delivery side closed. Then open the valve gradually. When the air in the pipe has been bled off the pump will run smoothly and silently.

6.3.2 Checking the Direction of Rotation of the Motor

There is no need to check the direction of rotation of the motor since it is pre-set at the factory.

6.3.3 Operating Pressure Calibration

A pressure gauge must necessarily be installed on the delivery side as it may be necessary to modify the factory setting according to the actual installation conditions and system requirements.

The TKS system comes with a factory setting that enables it to be used.
To modify the pressure based on the actual system requirements proceed as follows:

- Increasing the pressure value

- Make sure that the system is pressurized, no user is open and the pump is off. If there are any open users you can close the on-off valve located on the pump's delivery side.
- Unscrew the plug that protects the adjusting screw.
- Turn the adjusting screw slowly to the right using a screwdriver.

Use the slotted blade screwdriver (2.5 mm) provided with the TKS system. The adjusting screw has a limited travel, less than one turn, between the minimum value (0 bar) and the maximum value (10 bar). Do not force it beyond the limits as you could damage the adjusting screw .

- The pump starts.
- Read the pressure value on the gauge and keep turning the adjusting screw until the gauge pointer reaches the desired value.
- Make sure that the pressure has stabilized at the desired value.
- If necessary, make slight adjustments by turning the adjusting screw to the right or left. If you need to lower the pressure setting, we recommend that you open a user partially (see next section "Lowering the pressure value").

Make sure that the new value you have selected is within the head range specified in the TKS system's rating plate.

- The pump stops after approx. 60 seconds. The switch-off pressure may be slightly higher than the desired value (chapter 6.4.1)

- Lowering the pressure value

- Make sure that the system is pressurized, no user is open and the pump is off.
- Unscrew the plug that protects the adjusting screw.

- Open the on-off valve located on the pump's delivery side.
- Open a user or the test tap (chapter 6.1) partially, allowing the pressure to drop slowly.
- The pump starts.
- Turn the adjusting screw slowly to the left using a screwdriver.

Use the slotted blade screwdriver (2.5 mm) provided with the TKS system. The adjusting screw has a limited travel, less than one turn, between the minimum value (0 bar) and the maximum value (10 bar). Do not force it beyond the limits as you could damage the adjusting screw.

- Read the pressure value on the gauge and keep turning the adjusting screw until the gauge pointer reaches the desired value.
- Make sure that the pressure has stabilized at the desired value.
- If necessary, make small adjustments by turning the adjusting screw to the right or left.

Make sure that the new value you have selected is within the head range specified in the TKS system's rating plate.

- The pump stops after approx. 60 seconds. The switch-off pressure may be slightly higher than the desired value (chapter 6.4.1).

For further information refer to chapter 12.

6.3.4 Indicator Lights

On the adhesive plate attached to top of the radiator there are three LED's with the following functions :

Steady green light	Power	Indicates that the TKS system is powered
Steady yellow light	Run	Indicates that the pump is running
Flashing red light	Alarm	Indicates an alarm has triggered

If an alarm is triggered, the red light will flash more or less rapidly depending on what has caused the system to shut down. Except for lack of water on the suction side, in all other cases the system will automatically start again after 20 seconds. If the cause of the malfunction persists, after three attempts to restart the system will definitively shut down except in case of lack of water on the suction side.
For further information refer to chapters 8.1 and 12.

6.4 Product Description **Information for users**

The TKS system consists of an electric pump operated by an automatic electronic control system (frequency converter known also as speed variator) that enables the delivery of constant pressure by reducing or increasing the flow rate based on the water demand.

6.4.1 Operation

The automatic electronic control system receives a signal from a pressure sensor and compares it with the set value.
When the system is pressurized the pump is switched off. Water consumption by the users determines a decrease in system pressure which causes a reduction in the value of the signal. In this case the control system starts the pump, regulating its speed until the reference or operating pressure is re-established. If the water consumption increases the control system increases the speed of the pump, while if the water consumption diminishes the control system decreases the speed of the pump. When the maximum flow rate of the pump is reached, the control system runs the pump at its maximum nominal speed.
If the pressure increases because of decreased water consumption, the value of the signal from the sensor increases; in this case the control system reduces the speed of the pump.
If there is a swift decrease in water consumption (e.g. due to sudden closing of the faucets), the control system runs the pump at minimum speed for approx. 60 seconds and then stops it. In this case the stopping pressure coincides with the set value.

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If the water consumption decreases gradually, the system runs the pump at a slightly higher pressure for approx. 60 seconds (with transmitter full scale equal to 10 bar → + 0.2 bar), and then stops it if there is no further water consumption.

If the system is powered the green (Power) light is on.
When the pump is running the yellow (Run) light is on.
If there is a shutdown or malfunction the red (Alarm) light comes on.
If an alarm is triggered, the red light will blink more or less rapidly depending on the cause of the shut-down. Except for lack of water on the suction side, in all other cases the system will automatically start again after 20 seconds. If the cause of the malfunction persists, after three attempts to restart the system will definitively shut down.

Refer to experienced and qualified personnel for any adjustments and/or maintenance operations. Do not attempt to change the settings or open the control system.

Before using the equipment, read the manuals and store them safely.
Store the screwdriver supplied with the TKS system in a safe place.

7. Maintenance

Information for maintenance personnel

Observe the following directions if you need to carry out any service operations on the product .

Maintenance operations must be performed by qualified personnel only.

Before carrying out any maintenance operations, make sure that all the connections (even those that are potential-free) are voltage-free.

Always disconnect the TEKNOSPEED converter from the power supply before carrying out any operations on the system's mechanical or electrical components.
After disconnection from the power source, wait at least 1 minute before carrying out any work on TEKNOSPEED to allow the condensers in the internal circuit to discharge.

Read this user's manual and the operating instructions for the electric pump and diaphragm tank (if installed).

7.1 Routine Maintenance

The TKS system does not require any routine maintenance provided that the working limits described in chapter 4 are observed.
The pumps do not require any routine maintenance (read the pump's manual).
Check the air pre-charge in the surge tank, if installed, at least once a year (chapter 6.1.1).

7.2 Extraordinary Maintenance

Use adequate equipment and protections. Observe the accident prevention regulations in force. Lift and handle the pumps carefully, using suitable hoisting equipment.

Use only original spare parts to replace any worn or faulty components.

WARNING !
Although the TKS system has a single-phase power supply, the pump's motor is always a three-phase motor connected to 230 V. The missing phases are created by the converter. For further information refer to chapter 12.

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8. Troubleshooting

Information for users and maintenance personnel

Read this user's manual and the operating instructions for the electric pump and diaphragm tank (if installed).

Maintenance operations must be performed by qualified personnel only.

For further information refer to chapters 7 and 12.

8.1 Visual Signaling Devices

8.1.1 Operation Signals

Green light (power)	Off	No power	○
Green light (power)	On steady	Power	●
Yellow light (run)	Off	Pump off	○
Yellow light (run)	On steady	Pump running	●

TKS_M0025_A_OT.XLS

These basic signals are integrated by the alarm signals. Therefore there could be combinations of signals such as green light on (power), yellow light off (pump off) and flashing red light (alarm).

8.1.2 Alarm signals

If an alarm is triggered the red light flashes more or less rapidly (flashing – pause – flashing) depending on the cause of the system shutdown.

Red light (alarm)	Off	No malfunction	○
Red light (alarm)	Flashing	Overcurrent shutdown	✳ x 2 ○ ✳ x 2
Red light (alarm)	Flashing	Converter overtemperature shutdown	✳ x 3 ○ ✳ x 3
Red light (alarm)	Flashing	Motor overtemperature shutdown	✳ x 4 ○ ✳ x 4
Red light (alarm)	Flashing	Shutdown caused by lack of water on suction side Or shutdown caused by open external switch contact	✳ x 5 ○ ✳ x 5
Red light (alarm)	Flashing	No signal from transmitter shutdown	✳ x 6 ○ ✳ x 6
Red light (alarm)	Flashing	Low voltage (undervoltage) shutdown	✳ x 7 ○ ✳ x 7
Red light (alarm)	Flashing	Problems at serial output (for 2-pump units)	✳ x 8 ○ ✳ x 8

TKS_M0026_A_OT.XLS

Be careful when servicing the system as it could restart automatically.

Shutdown caused by lack of water on suction side

If the system shuts down because there is not enough water on the suction side, it will restart automatically only if the external device re-enables its operation (float switch or pressure switch or switch → chapters 6.2.7 and 6.2.8).

Shutdown caused by other problems except for lack of water on suction side

In all these cases the system restarts automatically after 20 seconds. If the cause of the malfunction persists, the system will shut down definitively after three attempts to start.

To reset the system, disconnect the power supply for at least one minute.
If 10 minutes elapse after an alarm without any other malfunctions occurring, the alarm counter is reset and three new attempts are possible.

If two or more alarms are triggered simultaneously (e.g. due to motor overtemperature and lack of water), only the first malfunction signal received by the control board is signaled.

WARNING ! The converter does not have a non-erasable alarm log, we therefore recommend that you observe the flashing frequency carefully before disconnecting the power supply to the TKS system.

For further information refer to chapters 8.1 and 12.

8.2 Troubleshooting Guide

PROBLEM	PROBABLE CAUSE	POSSIBLE REMEDY
The electric pump does not start Main switch on Green light off	No power supply	Restore the power supply
	Triggering of magneto-thermal switch	Reset the switch
The electric pump does not start or it stops if it is already running The main switch is on Green light on Red light on (*** flashes)	*** = 2 flashes	
	Motor overload	Check the working conditions of the electric pump
	Damaged motor stator	Check the motor
	*** = 3 flashes	
	Converter overtemperature	Check to see if anything is preventing the proper cooling of the converter
	*** = 4 flashes	
	Motor overtemperature (if the terminal board is equipped with the PTC protection)	Check the working conditions of the electric pump
	*** = 5 flashes	
	Triggering of dry running	Check the water level
		Check the external device and the related connection cables
	*** = 6 flashes	
	Problems with the pressure transmitter	Check the transmitter and the related connection cable
	*** = 7 flashes	
	The supply voltage is too low	
Users closed Electric pump running with speed increasing and decreasing cyclically Green light on Yellow light on Red light off	Water leaks through the non-return valve or in the system	Check the system in order to locate the leaks.Repair or replace any faulty components.
	Undersized surge tank	Check the working conditions of the electric pump
	Ruptured surge tank diaphragm	Replace the diaphragm
	Setting of work point not suitable for the system (the value is higher than the pressure that the pump is able to deliver)	Modify the system settings
Users open The electric pump does not start Green light on Yellow light off Red light off	Setting of work point not suitable for the system (the value is equal to zero)	Modify the system settings
The electric pump is running. There are vibrations in the pump or near the pump	Setting of work point not suitable for the system (the value is lower than the minimum pressure that the pump can deliver)	Modify the system settings
Frequent starts and stops	There may be problems with the float switch in the suction tank	Check the float switch and the tank
The electric pump is running always at maximum speed	There may be problems with the pressure transmitter	Check the hydraulic connection between the transmitter and the system

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Triggering of general system protection	Short circuit	Check the connection cables
Triggering of differential system protection (circuit breaker)	Ground leakage	Check the insulation of the electric pump and cables

9. Spare Parts

Information for maintenance personnel

Always state the exact model identification number and construction number when requesting technical information or spare parts from our Sales and Service Center.

Use only original spare parts when replacing any faulty components.

The use of unsuitable spare parts can cause malfunctions, personal injury and damage to property.

10. Disposal

Information for installers and maintenance personnel

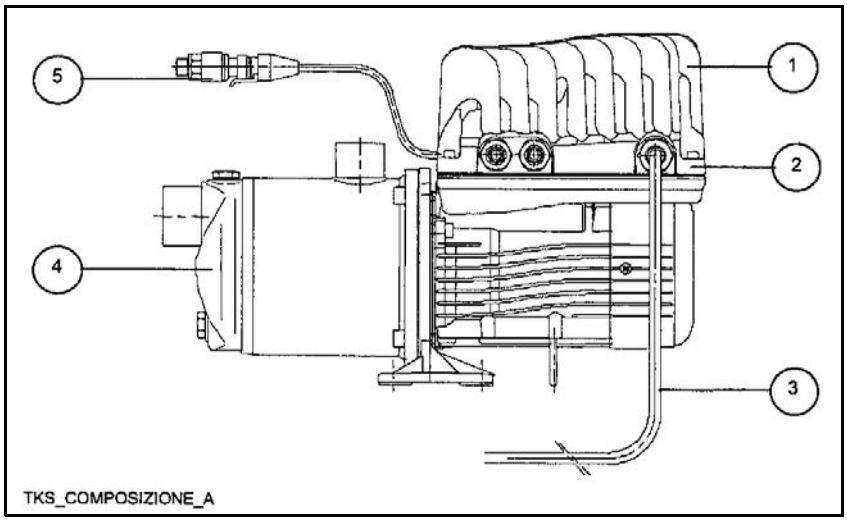
After installing the unit, dispose of packaging according to legislation in force; if possible, re-utilize the packaging for other purposes.
If the motor needs to be decommissioned and dismantled, observe the current legislation regarding sorted waste disposal.

11. Warranty

Refer to the sales documents for any information.

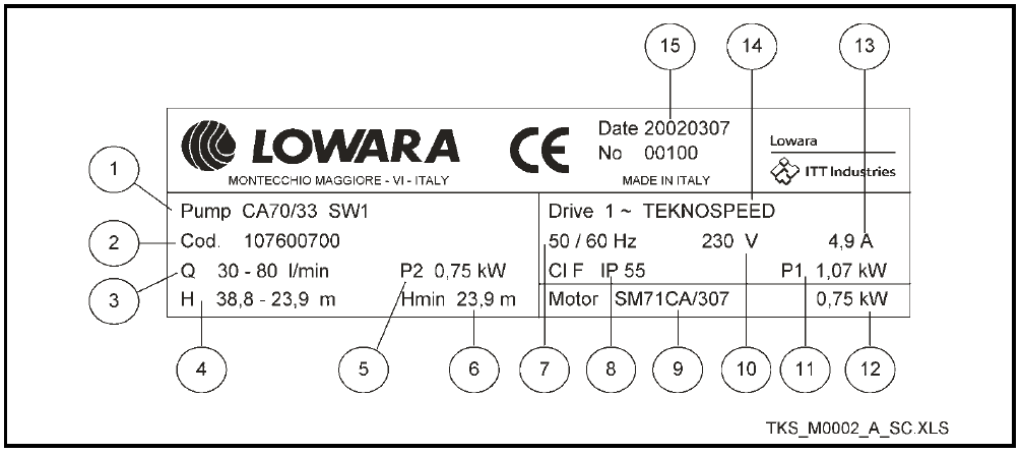
12 Tables and Drawings

TKS system composition (chapters 3 and 6.4)



1 Radiator (incorporates the electronic control and command board)
2 Base
3 Cable and plug
4 Electric pump
5 Pressure transmitter

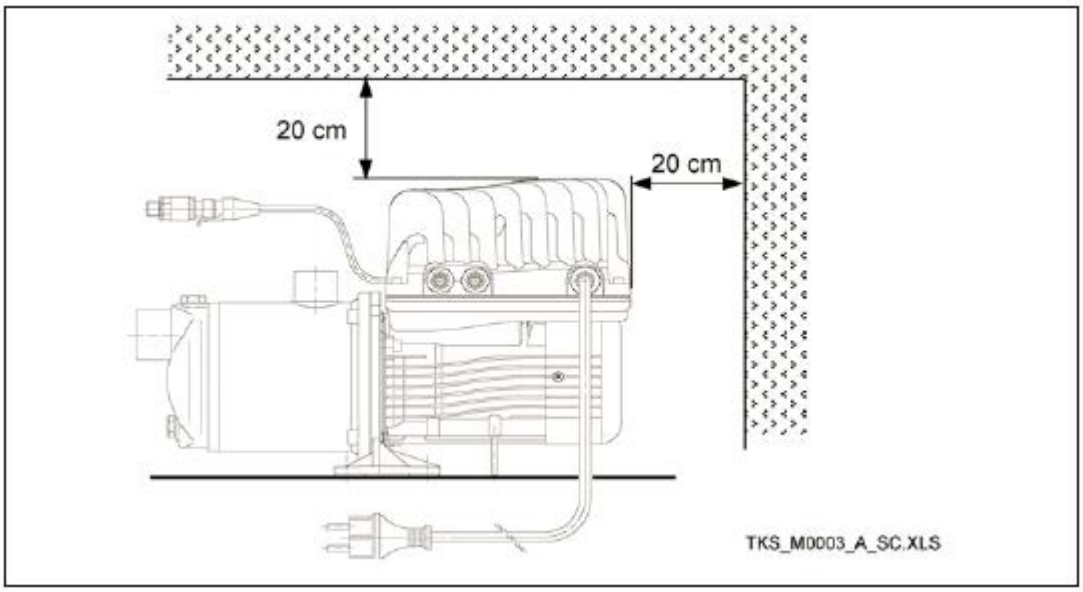
Rating plate (chapters 4 and 9)



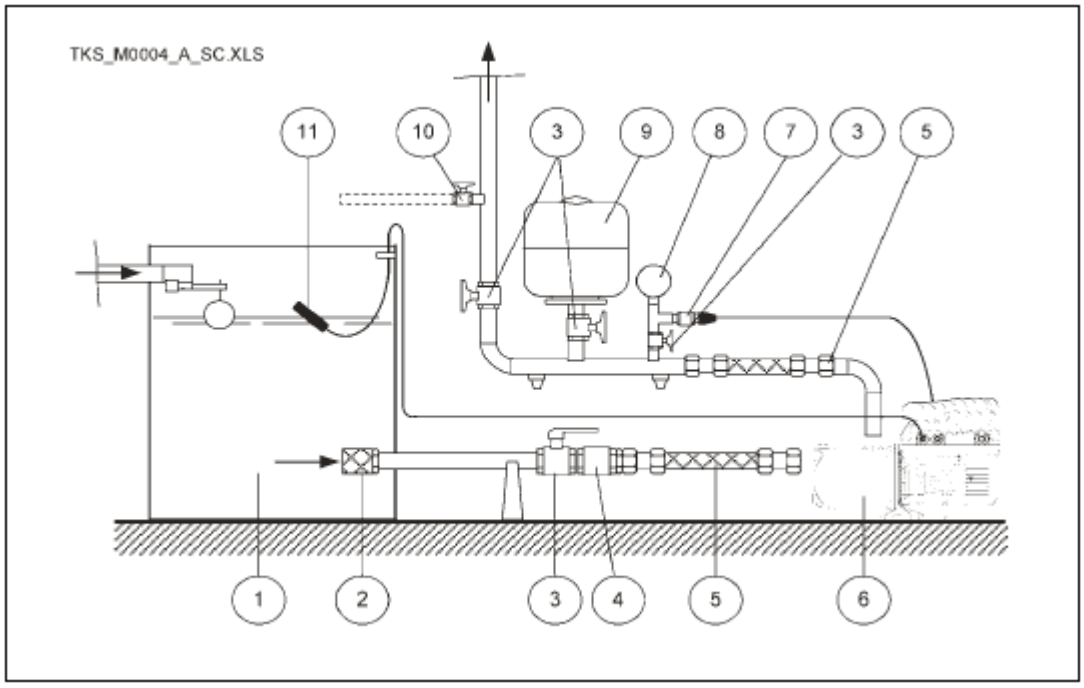
1 Electric pump type
2 Code
3 Flow range
4 Head range*
5 Rated power
6 Minimum head*
7 Frequency
8 Insulation class and protection class
9 Motor type
10 Voltage
11 Input power
12 Rated motor power
13 Current
14 Converter type
15 Manufacturing date and Serial number

* note: for water, 10 meters of head are equivalent to almost 1 bar (approx. 100 Kpa)

Minimum clearance required to ensure proper cooling (chapter 5)

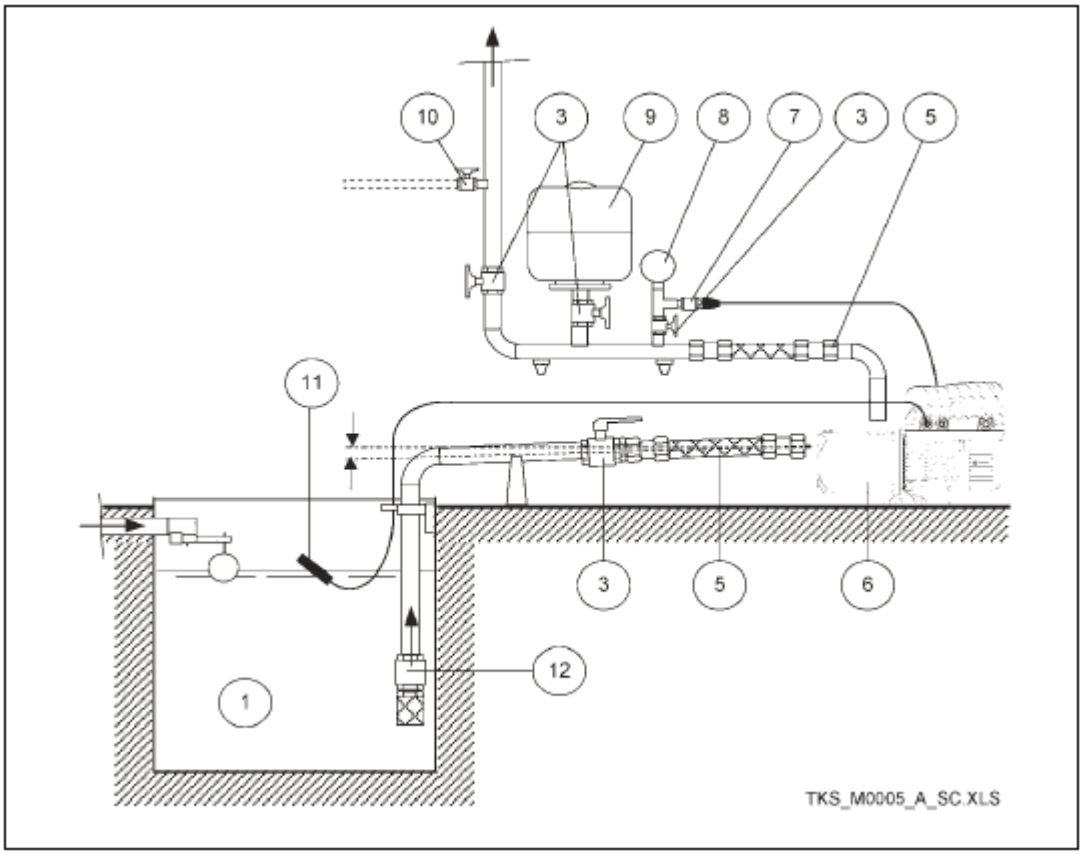


Examples of installation (chapter 6)



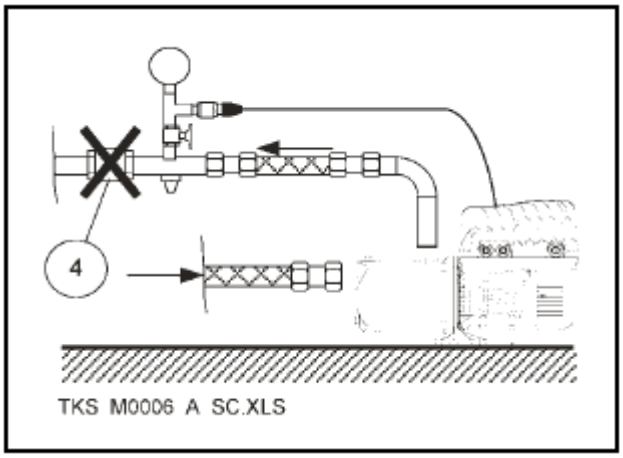
1 Reservoir or tank
2 Possible filter
3 On-off valve
4 Non-return valve
5 Flexible pipe
6 Electric pump with Teknospeed
7 Pressure transmitter
8 Pressure gauge
9 Diaphragm tank
10 Test tap
11 Float switch

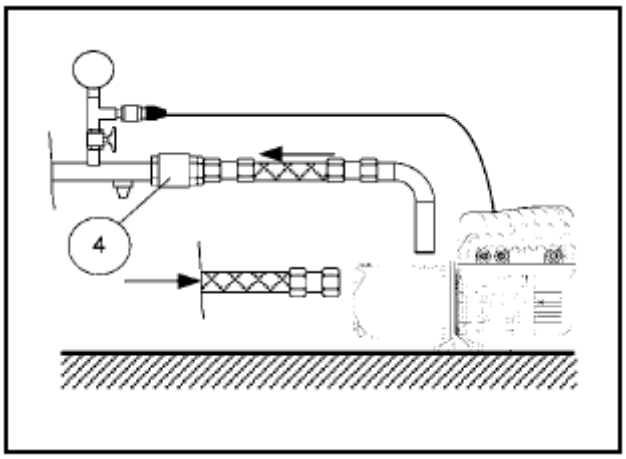
Suction lift



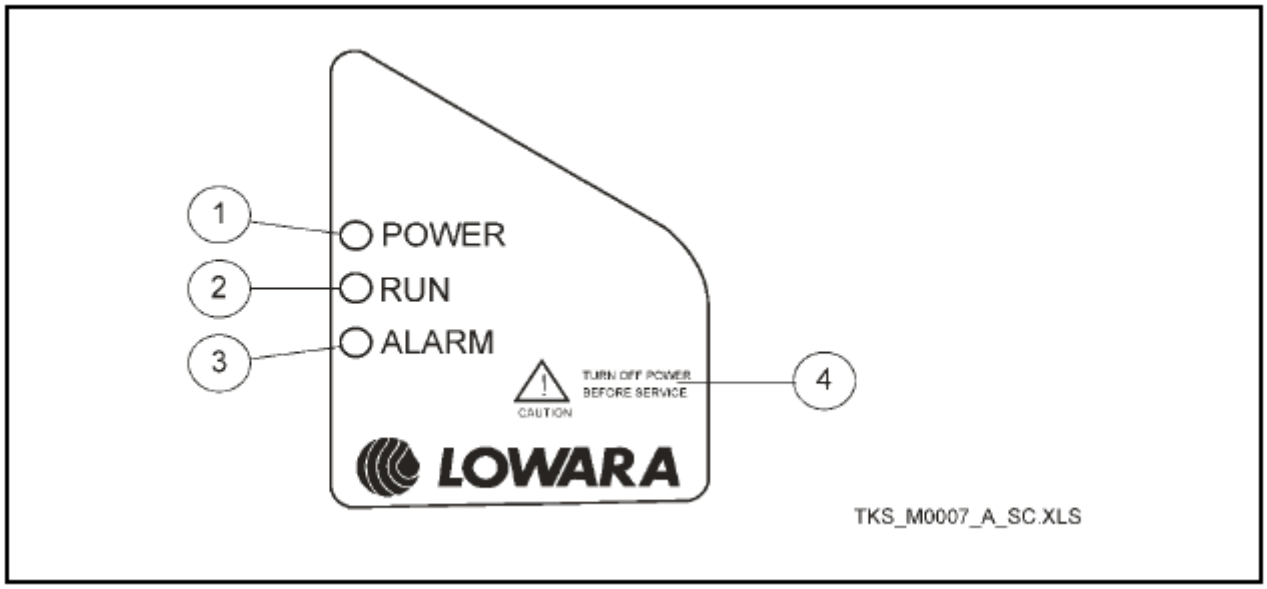
1 Tank
3 On-off valve
5 Flexible pipe
6 Electric pump with Teknospeed
7 Pressure transmitter
8 Pressure gauge
9 Diaphragm tank
10 Test tap
11 Float switch
12 Foot valve

Non return valve



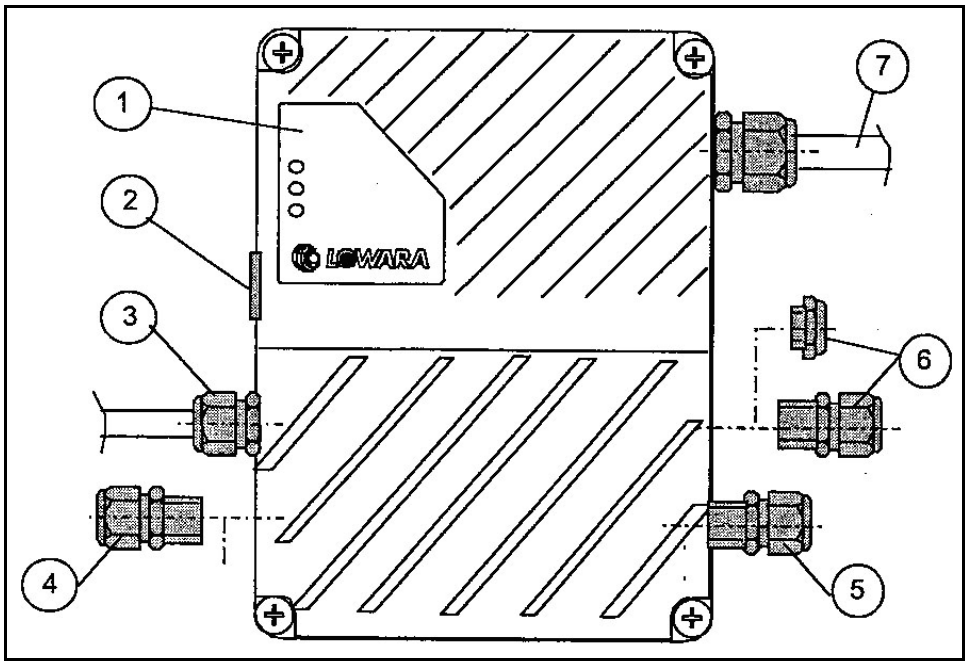


Adhesive plate (chapter 6)



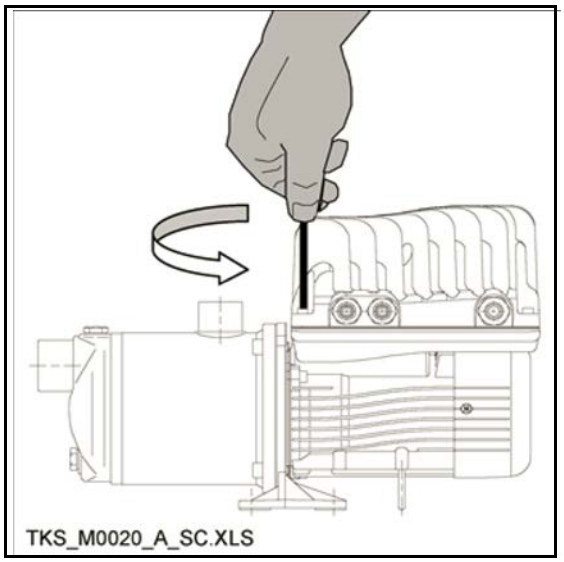
1 Power on indicator light
2 Pump running indicator light
3 Malfunction indicator light
4 Warnings

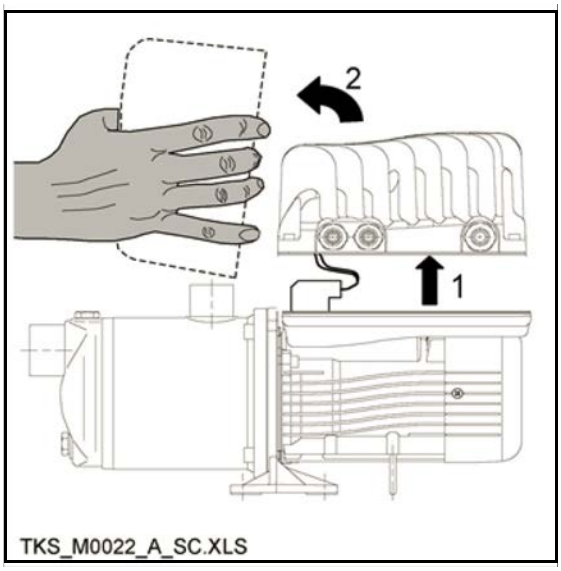
Diagram of TEKNOSPEED converter's external connections (chapter 6)

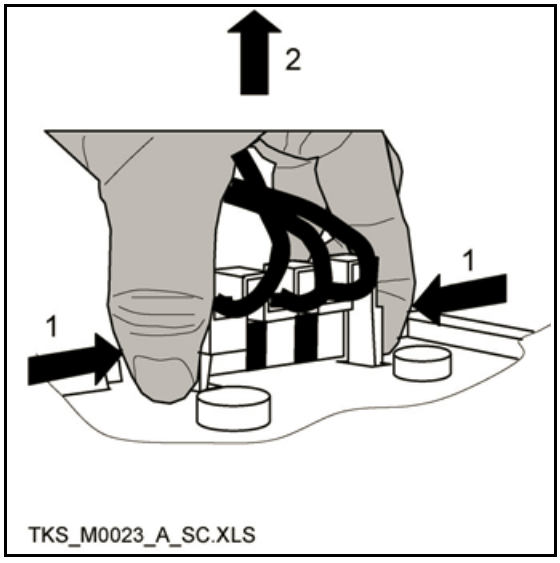


1 Signalling lights
2 Pressure adjusting screw
3 Inlet for pressure transmitter cable (M16 x 1.5 cable gland)
4 Inlet for external dry running protection device cable (M16 x 1.5 cable gland or plug)
5 Inlet for serial interface cable (M16 x 1.5 cable gland or plug)
6 Inlet for malfunction signalling relay cable (M16 x 1.5 cable gland or plug)
7 Inlet for power supply cable (M20 x 1.5 cable gland)

TEKNOSPEED converter opening sequence (chapter 6)







How to fasten the cable shielding (chapters 6.2.8, 6.2.9, 6.2.11)

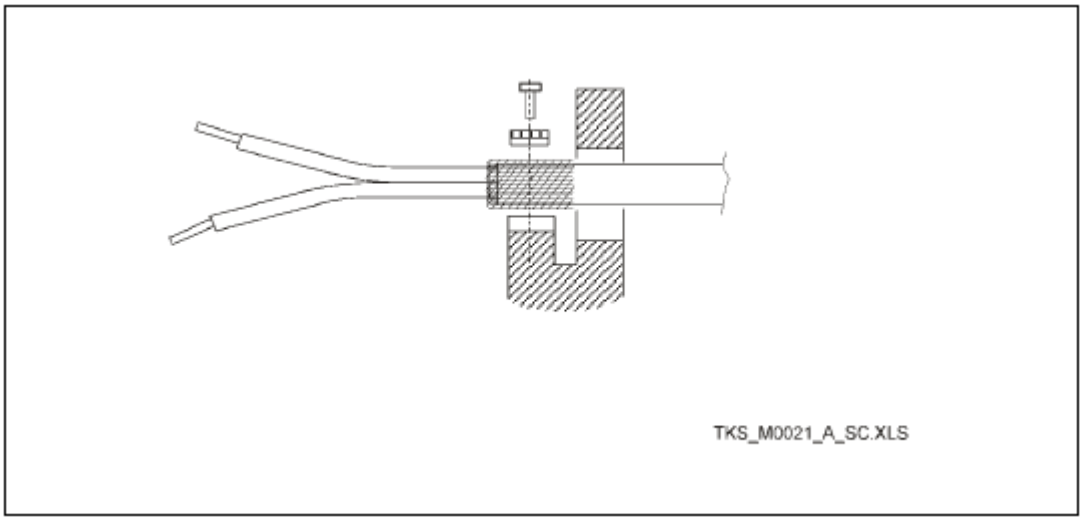
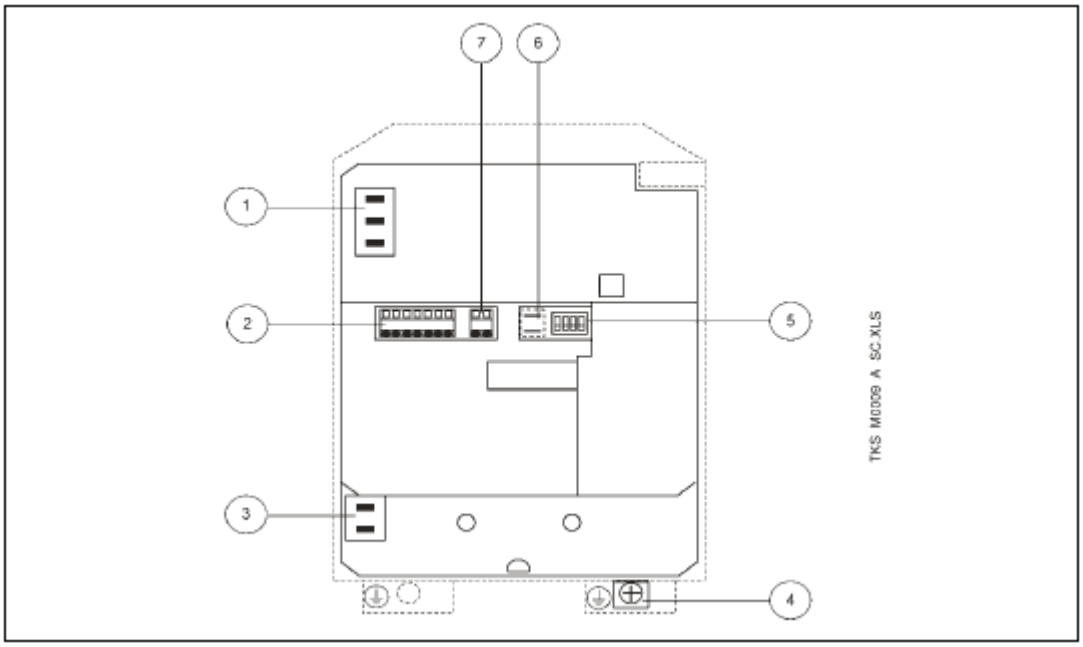
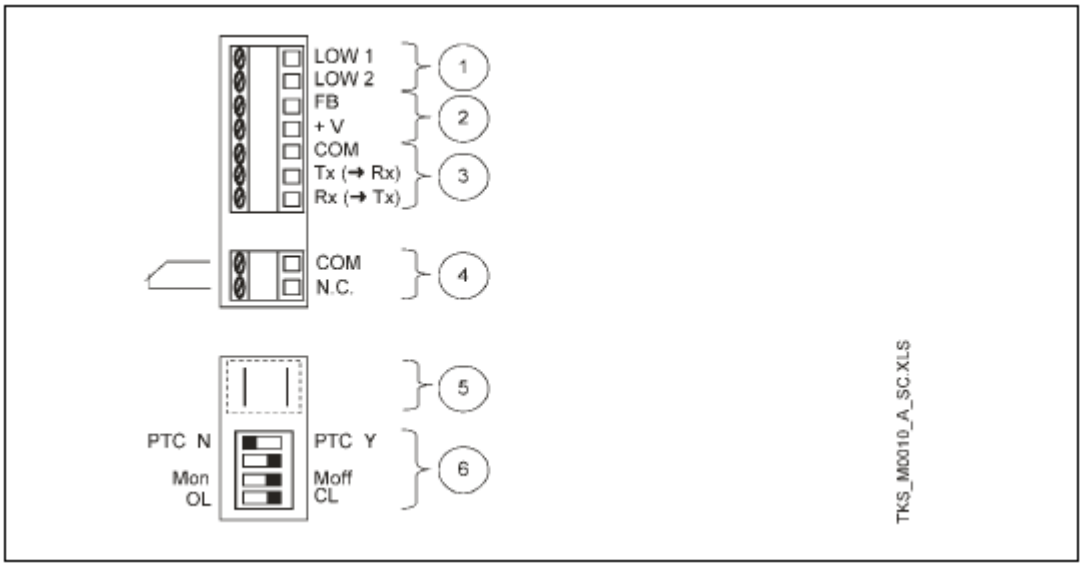


Diagram of TEKNOSPEED converter's internal connections (chapter 6)



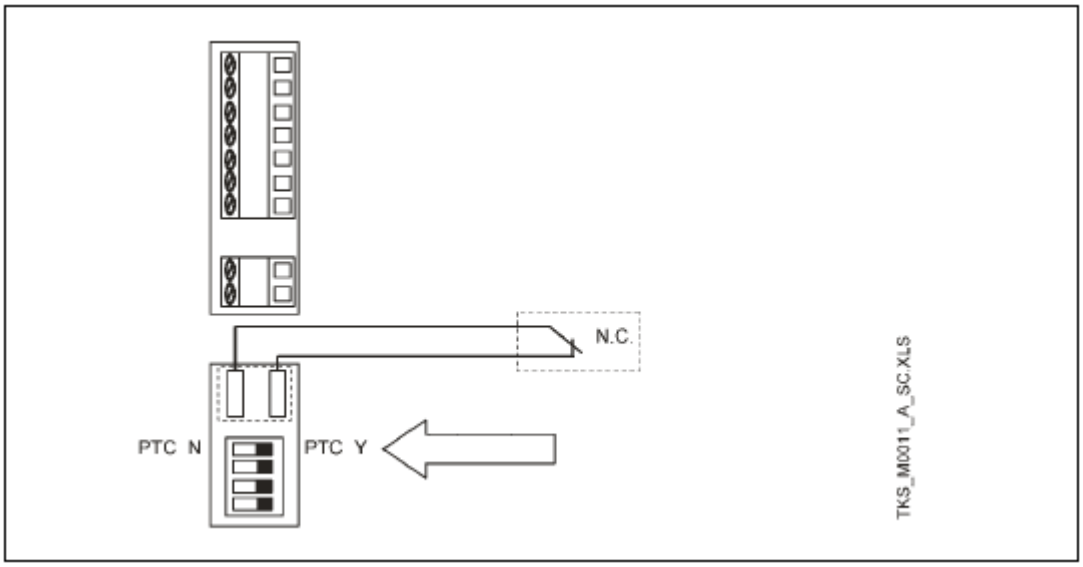
1 6.35 mm Faston male connectors for motor terminal board cables
2 Terminal board for transmitter, float switch, serial interface (IN / OUT)
3 6.35 mm Faston male connectors for phase and neutral (power cord)
4 Ground screw for power cord
5 Operating cycle adjustment dip-switch
6 2.8 mm Faston male connectors for thermistor
7 Terminal board for malfunction signals (OUT)

Auxiliary terminal board

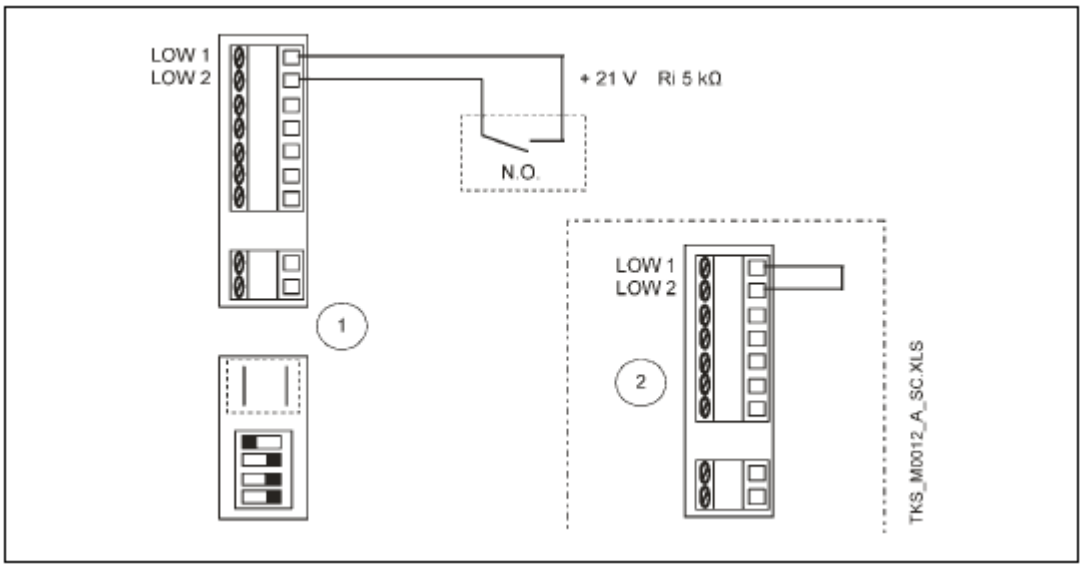


1 Connection to external device for dry running protection (chapters 6.2.7 and 6.2.8)
2 Connection to external transmitter (chapter 6.2.11)
3 Serial interface connection (chapter 6.2.10).
4 Connection to alarm relay (chapter 6.2.9)
5 Connection to motor over temperature protection – PTC (chapter 6.2.5)
6 Operating cycle adjustment dip-switch (chapter 6.2.12)

Connection to motor over temperature protection – PTC (chapter 6.2.5)



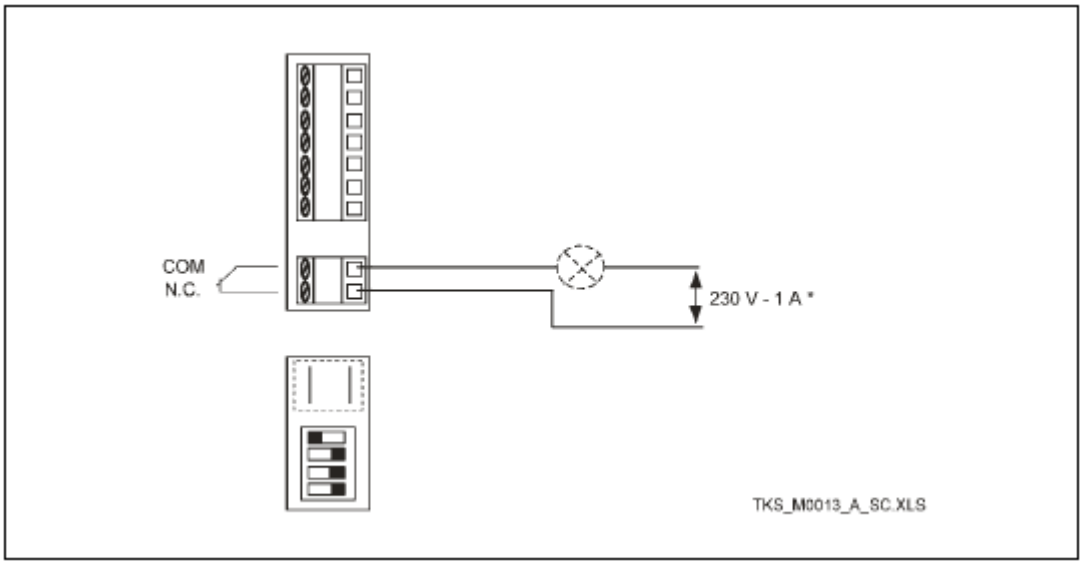
Connection to external device for dry running protection (chapters 6.2.7 and 6.2.8)



1 Float or pressure switch

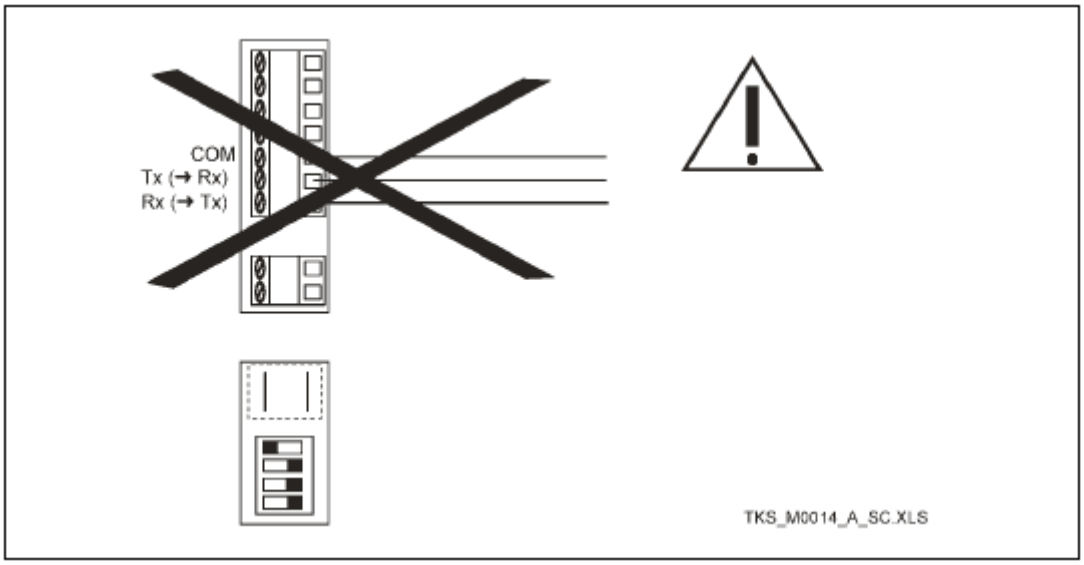
2 No external device

Connection to alarm relay (chapter 6.2.9)

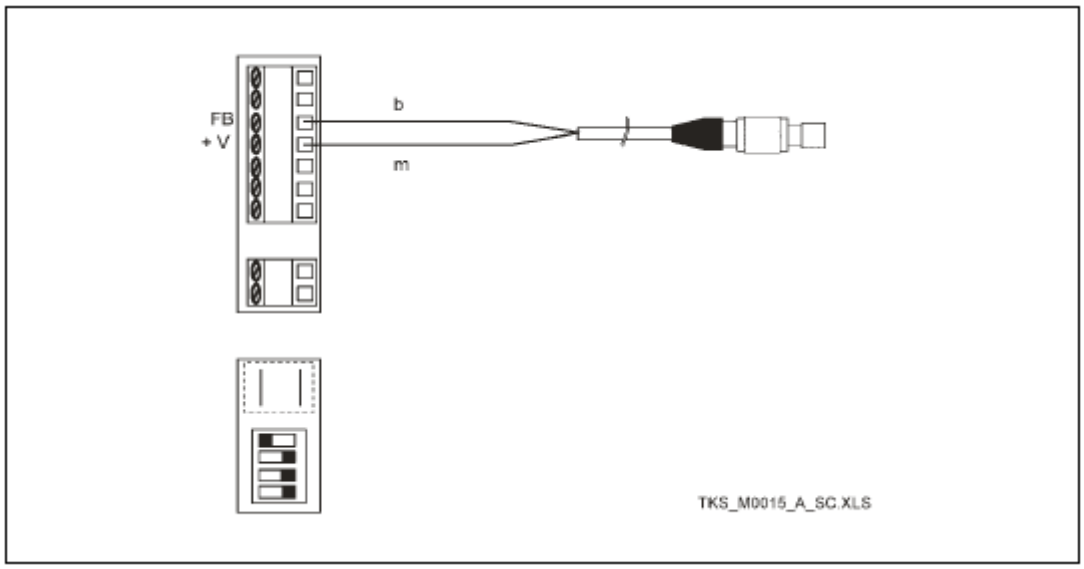


* maximum 230 Vac, maximum 1 A of resistive load only

Serial interface connection (chapter 6.2.10)

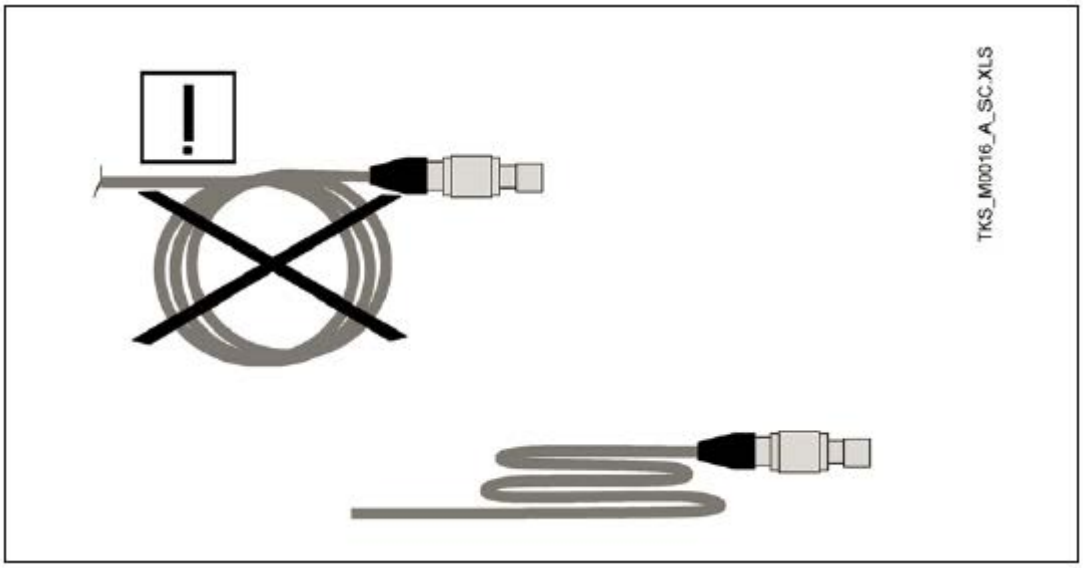


Connection to external transmitter (chapter 6.2.11)

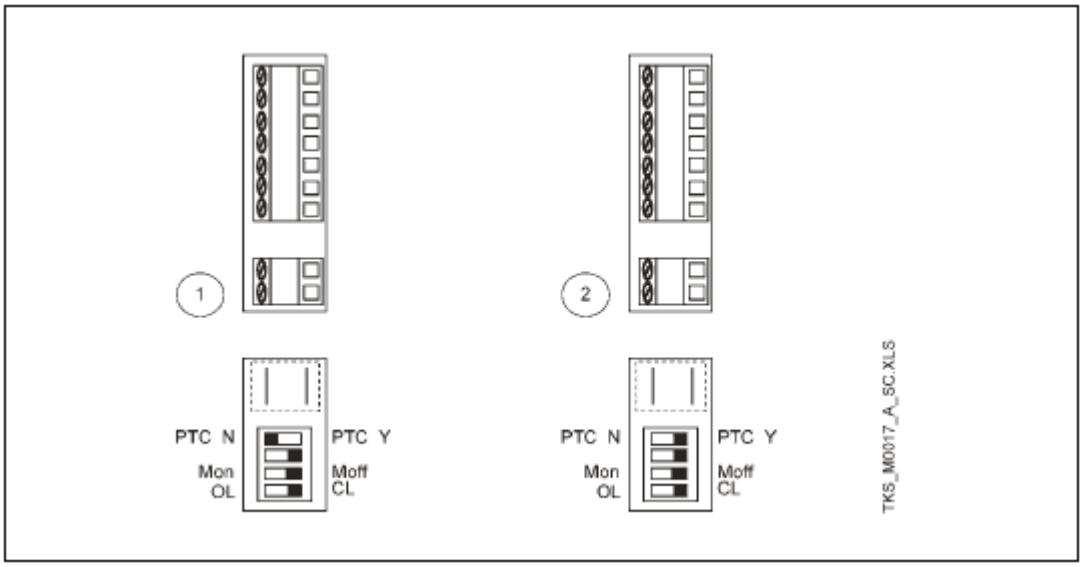


b = white
m = brown

How to fold the external transmitter cable (chapter 6.2.11)

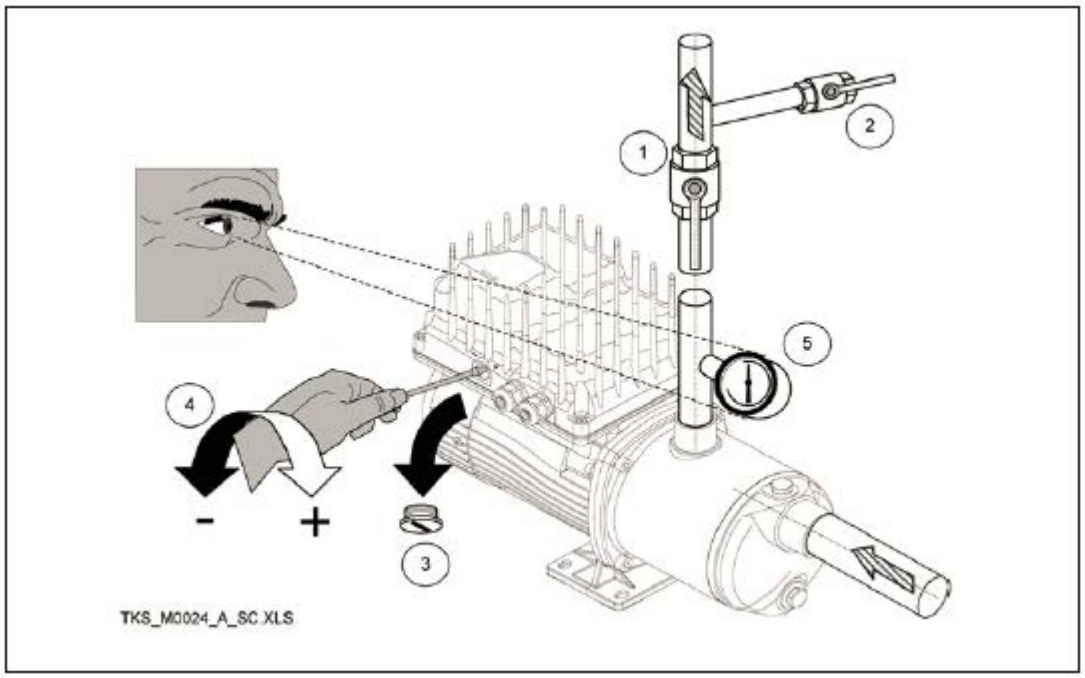


Factory settings of dip-switches for operating cycle adjustment (chapter 6.2.12)



1 Version without PTC protection
2 Version with PTC protection

Factory settings modification procedures (chapter 6.3.3)



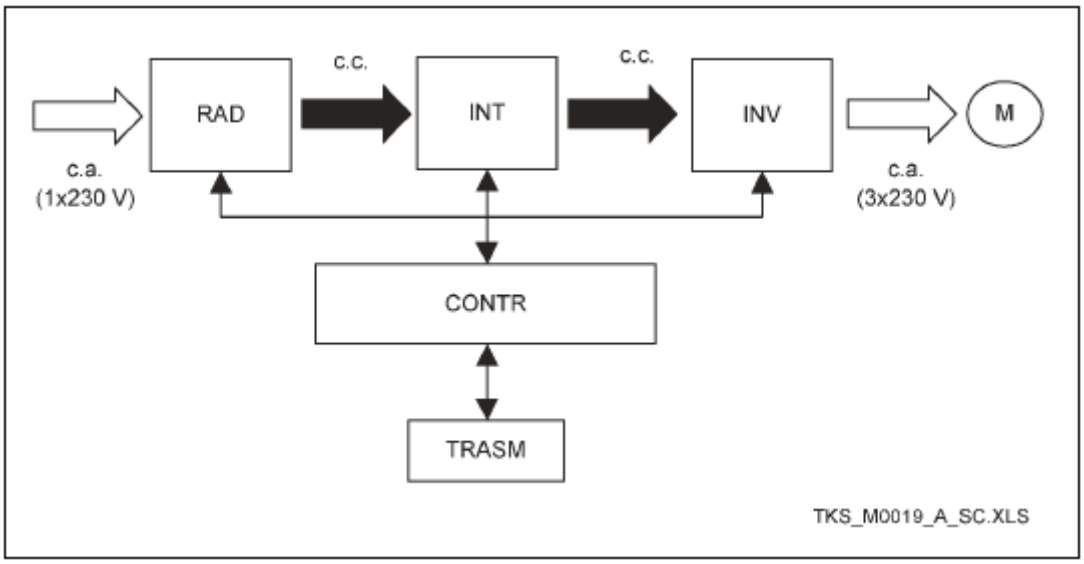
1 On-off valve on delivery side
2 Test tap
3 Adjusting screw protection plug
4 Adjustment screwdriver
5 Pressure gauge for reading of system pressure value

Factory setting chart (chapter 6.3.3)

TKS/.....	PRESSIONI - PRESSURES - PRESSIONS - DRUCKWERTE - PRESSOES - DRUKWAARDEN	
	kPa	bar
....BG7	300	3,0
....BG11	350	3,5
....CEA80/5	250	2,5
....CEA120/5	200	2,0
....CA70/33	300	3,0
....CA70/44	400	4,0
....2HMZ3T	150	1,5
....2HMZ5T	250	2,5
....2HMZ7T	400	4,0
....4HMZ4T	150	1,5
....4HMZ5T	200	2,0
....4HMZ9T	350	3,5
....SV206F07T	350	3,5
....SV208F11T	500	5,0
....SV404F07T	200	2,0
....SV407F11T	350	3,5

TKS_M0018_B_OT.XLS

Basic structure of TEKNOSPEED frequency converter (chapter 6.4)



c.a. Alternate current
c.c. Direct current
RAD Rectifier
INT Intermediate circuit
INV Inverter
MOT Motor
CONTR Control circuit
TRASM Transmitter

13 Declaration of Conformity

Lowara srl, with headquarters in Montecchio Maggiore - Vicenza – Italy, hereby declares that the products described below

TKS series electric pumps equipped with Teknospeed frequency converter, pressure transmitter with two-meter cable and power cord with plug

comply with the provisions of the following European Directives and with the regulations transposing them into national law

- Machinery 98/37/EEC
- Low Voltage 73/23/EEC and subsequent amendments
- Electromagnetic Compatibility 89/336/EEC and subsequent amendments

and with the following technical standards

- EN 60335-2-41, EN 55014-1, EN 55014-2, EN 61000-3-2, EN 61000-3-3

Montecchio Maggiore – Italy, 31.10.2002

Amedeo Valente
(Director of R&D and Engineering)

C

Appendix C
Manufacturer's Guide - FAM Pressure Vessel

This Appendix contains a modified version of the Installation, Safety, and Maintenance instructions provided by FAM Water Technology for their Pressure Vessels.

General

This product was designed for use in water lifting systems using submersed and surface electric pumps. Its function is to absorb and conserve the potential energy of the pressurised liquid.

Stored energy from liquid under pressure is transferred to the water system when required and becomes serviceable once again. The interchangeable diaphragm expansion tanks can also prevent water hammering.

Installation Safety Notes

These notes are taken from the FAM Pressure Vessel Installation Manual.

- This product is designed to hold water up to +110 °C.
- Never exceed the maximum working pressure and temperature of the expansion tank; ensure appropriate controls are installed for this purpose.
- During installation prepare adequate systems for drainage to limit damage caused by leakage from the tank, draining and venting.
- During installation the installer should account for external stress such as traffic, wind and earthquakes.
- Always install the appliance in conformity to current legislation.
- This product must be installed and regularly inspected by qualified personnel only.
- The manufacturer shall not be held liable for any personal or material damage caused by the product if installed and/or used improperly or in way anyhow diversely from manufacturer’s specifications.
- Exceeding temperature and pressure limits specified by the manufacturer will give cause to cancel any guarantee covering the product as well as any manufacturer’s liability.
- For fluids other than water, check compatibility before installing.
- The appliance must be installed in a safe place with access for authorized personnel only.
- The appliance must be protected by an appropriate earthing systems or isolated from the system by a dielectric joint.

Periodic Maintenance

Periodic maintenance is recommended at least twice a year and should be carried out by authorised specialised personnel only.

1. First check that the expansion or pressure tank is totally drained of water, and that the system is switched off and no electrical parts are live.
2. Check and, if necessary reset the precharge pressure, using the procedure in Section 4 page 31 of this Dutypoint manual. Ensure that the pressure does not exceed the value specified in the procedure.

General Maintenance and Repair

Disconnect all electrical equipment before starting on any maintenance jobs or checking the installation pressure and temperature. The precharge pressure should be checked and if necessary corrected during any maintenance work.

Precharge instructions

Referring to fig C-1:

1. First check that the expansion or pressure tank is totally drained of water, and that the system is switched off and no electrical parts are live.
2. Remove the air vent cover.
3. Unscrew the air valve cap.
4. Connect a pressure gauge and, referring to the procedure in Section 4 page 31 of this Dutypoint manual. verify that the precharge pressure is correct.

   If it is low then the vessel precharge must be corrected by additional inflation of the diaphragm.
5. When the precharge pressure is correct replace the air valve cap and vent cover.

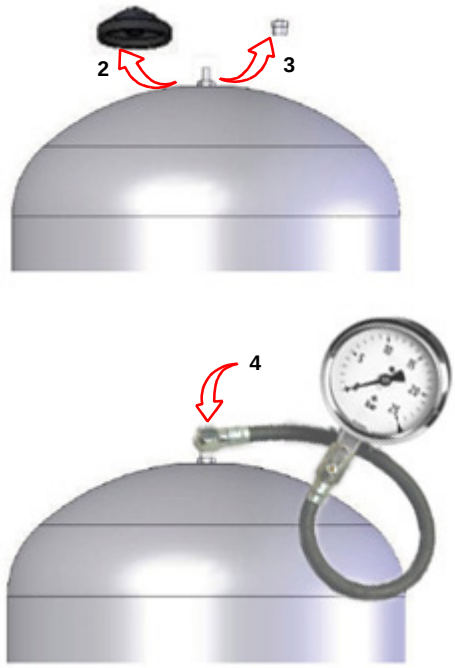


Fig. C-1 Pre-charging a FAM Vessel

Diaphragm replacement

To replace the diaphragm refer to fig C-2.

1. Empty the expansion tank.
2. Remove the pre-charging by releasing the air-vent.

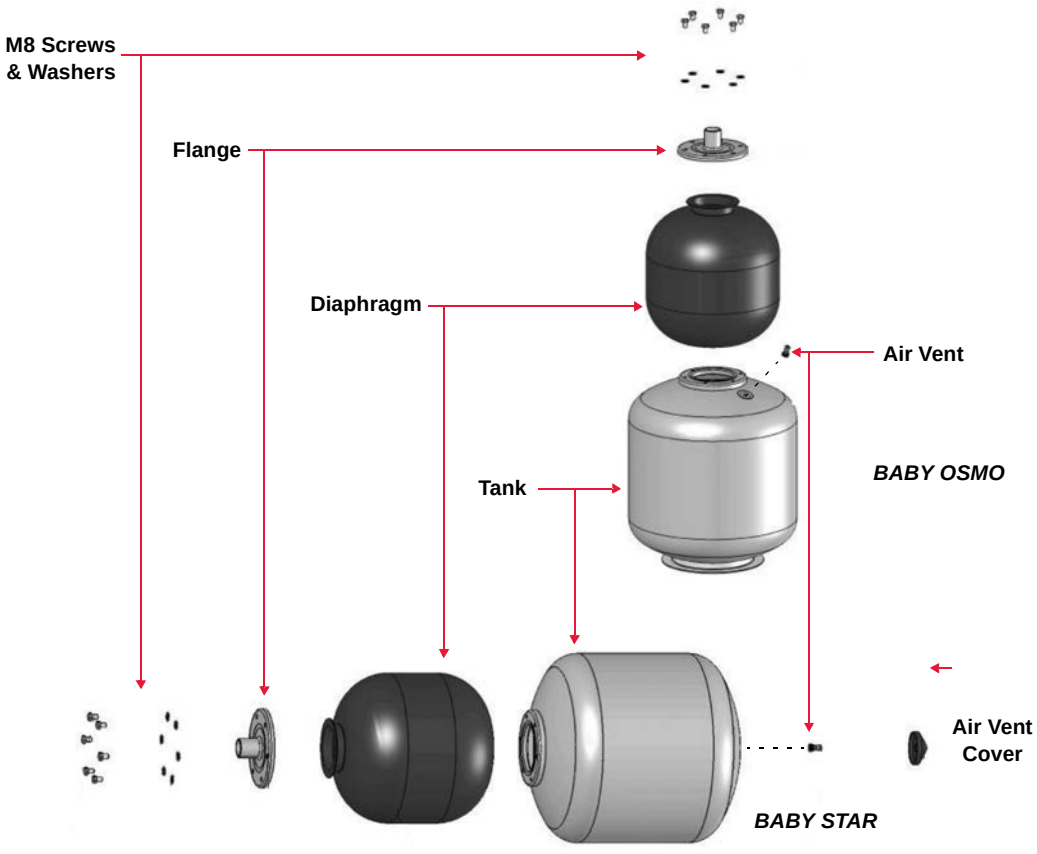


Fig. C-2 Baby Star & Baby Osmo Components

3. Loosen the M8 screws fastening the flange.
4. Remove the flange.
5. Extract the diaphragm and replace it.

Installing a Replacement Vessel

Read these instructions carefully before installing the product.

1. Make sure the product is in good condition. If the product is damaged do not start on installation but take it back to the seller for immediate replacement.
2. The product must be installed in the position (vertical or horizontal) specified in the technical specifications (see installation diagram).
3. While the system is cold, measure the static pressure with a gauge, at the point where the tank has to be installed.
4. Set the precharge pressure, using the procedure earlier in this section on page 85. Ensure that the pressure does not exceed the value specified in the procedure.
5. The appliance must be supplied with efficient and sufficient safety and control facilities, in particular the safety valve must be connected to the appliance and be free from interference and must be gauged to the quantity of fluid to be discharged.

   The safety valve should also be designed to ensure that the pressure does not permanently exceed the maximum tolerated pressure (a temporary pressure peak, limited to 10% of the maximum tolerated pressure, is allowed).
6. Make sure the cap of the valve is fitted tightly after pre-loading and that there is no leakage.

D

Appendix D
Miscellaneous Technical Information

This Appendix contains miscellaneous technical information applicable to Dutypoint equipment.

- ***Net Positive Suction Head (NPSH)***
- ***Convertion Factors***
- ***Variable Speed Flow, Head and Power Calculations***
- ***General Operating Limits (Standard Dutypoint Pumpsets)***

Net Positive Suction Head (NPSH)

The minimum operating values that can be reached at the pump suction end are limited by the onset of cavitation.

Cavitation

Cavitation is the formation of vapour-filled cavities within liquids where the pressure is locally reduced to a critical value, or where the local pressure is equal to, or just below the vapour pressure of the liquid. The vapour-filled cavities flow with the current and when they reach a higher pressure area the vapour contained in the cavities condenses.

The cavities collide, generating pressure waves that are transmitted to the walls. These, being subjected to stress cycles, gradually become deformed and yield due to fatigue. This phenomenon, characterised by a metallic noise produced by the hammering on the pipe walls, is called incipient cavitation.

The damage caused by cavitation may be magnified by electro-chemical corrosion and a local rise in temperature due to the plastic deformation of the walls. The materials that offer the highest resistance to heat and corrosion are alloy steels, especially austenitic steel. The conditions that trigger cavitation may be assessed by calculating the total net suction head, referred to in technical literature with the code NPSH (Net Positive Suction Head).

Calculating NPSH

The NPSH represents the total energy (expressed in m) of the liquid measured at suction under conditions of incipient cavitation, excluding the vapour pressure (expressed in m.) that the liquid has at the pump inlet.

To find the static height $\mathbf{h_z}$ at which to install the machine under safe conditions, the following formula must be verified:

$$\mathbf{h_p + h_z \geq (NPSH_r + 0.5) + h_f + h_{pv}}$$

Where:

- $\mathbf{h_p}$ is the absolute pressure applied to the free liquid surface in the suction tank, expressed in m. of liquid; h_p is the quotient between the barometric pressure and the specific weight of the liquid.
- $\mathbf{h_z}$ is the difference in height between the pump axis and the free liquid surface in the suction tank, expressed in m; h_z is negative when the liquid level is lower than the pump axis.
- $\mathbf{h_f}$ is the friction loss in the suction line and its accessories, such as: fittings, foot valve, gate valve, elbows, etc.
- $\mathbf{hp_v}$ the vapour pressure of the liquid at the operating temperature, expressed in m of liquid. hpv is the quotient between the Pv vapour pressure and the liquid's specific weight.
  0.5 is the safety factor.

The maximum possible suction head for installation depends on the value of the atmospheric pressure (i.e. the elevation above sea level at which the pump is installed) and the temperature of the liquid.

To help the user, with reference to water temperature (4°C) and to the elevation above sea level, the following tables show the drop in hydraulic pressure head in relation to the elevation above sea level, and the suction loss in relation to temperature.

Water temp (°C)	20	40	60	80	90	110	120
Suction loss (m)	20	40	60	80	90	110	120

Elevation above sea level (m)	500	1000	1500	2000	2500	3000
Suction loss (m)	0,55	1,1	1,65	2,2	2,75	3,3

Friction loss must be calculated using a recognised formula. To reduce it to a minimum, especially in cases of high suction head (over 4-5m.) or within the operating limits with high delivery values, we recommend using a suction line having a larger diameter than that of the pump's suction inlet.

It is always a good idea to position the pump as close as possible to the liquid to be pumped.

Make the following calculation:

Liquid: water at ~ 15 °C g = 1 Kg/dm3

Delivery required: 30 m3/h

Head for required delivery: 43 m

Suction difference in height: 3,5 m

The selection is a FHE 40-200/75 pump whose NPSH required value is 2.5m @ 30 m^3/h

For water at 15°C the h_{pv} term is: Pv/g = 0.174 m (0.01701 bar)

eh = Pa/g = 10.33 m

The h_f friction loss in the suction line with foot valves is 1.2 m.

By substituting the parameters in formula with the numeric values above:

$$10.33 + (-3.5) \geq (2.5 + 0.5) + 1,2 + 0.17$$

6.8 > 4.4. The relation is therefore verified.

Convertion Factors

Flow conversion			Pressure conversion		
L/min.	÷ 60	= L/Sec	m Hd	÷ 10.2	= Bar
m_3/hr	÷ 3.6	= L/Sec	Psi	÷ 14.47	= Bar
Gpm	÷ 13.2	= L/Sec	Kpa	÷ 100	= Bar
Kg/Sec	÷ 1.0	= L/Sec	Kg/cm^3	÷ 1.02	= Bar

Variable Speed Flow, Head and Power Calculations

V_1 = Full speed
V_2 = Reduced speed
Q_1 = Flow rate at full speed
Q_2 = Flow rate at reduced speed
H_1 = Head at full speed
H_2 = Head at reduced speed
P_1 = Power at full speed
P_2 = Power at reduced speed

$$Q_2 = \left(\frac{V_2}{V_1}\right) Q_1$$

$$H_2 = \left(\frac{V_2}{V_1}\right)^2 H_1$$

$$P_2 = \left(\frac{V_2}{V_1}\right)^2 P_1$$

General Operating Limits (Standard *Dutypoint* Pumpsets)

Type of pumped liquids	Water with no gas or aggressive substances
Maximum pumped liquids temperature	+35°C for domestic uses (EN 60335-2-41) 40°C for other purposes
Minimum pumped liquid temperature	1°C to avoid icing
Operating ambient temperature	+5°C to 40°C for indoor installation (CEI EN 60439-1)
Relative humidity	Max 50% at 40°C
Air impurities	The air must be clean and free of acid vapours, corrosive gases and excessive amounts of dust
Storage temperature	+5°C to 50°C
Suction Conditions	Minimum positive pressure 0.1 Bar, Max 0.5 Bar

E

Appendix E
Additional Information

If the system that you have purchased has been modified, updated or otherwise altered from the Dutypoint standard range, this Appendix will contains additional information applicable to the change(s).

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